EGYPT OIL&GAS NEWSPAPER

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Egypt's Nuclear Program:
More Questions than Answers

Interconnectivity:
Egypt's Aspiration for Regional Electricity Hub

Efficiency Plan:
Resolving Egypt's Electricity Crisis

The Changing Role of the CFO:
How Energy Transformation Is Shifting the CFO Focus

Service Companies:
Between Innovation and Oil Prices

EDITOR'S NOTE

HAPPY NEW YEAR 2016

Like all beginnings we are forced to examine our direction, our vision, and more importantly our goals. Here at Egypt Oil & Gas, we chose to begin the year with a bang. A whole new look and shape, but more importantly a whole new approach to quality. As a team we are continuously working on raising the quality and range by which we address pressing topics, and this issue has allowed us to take things a step further, by focusing on more of a research angle when tackling matters of energy.

This issue was designed to address multiple angles of the electricity profile in Egypt; beginning with an overview of the current state of the industry, then narrowing in on efficiency in production, examining other sources the government is beginning to include in its energy mix, and finally presenting an analysis of the government's goal to become an energy hub.

Focusing on electricity in this issue did not stop us from addressing other issues in the oil industry, beginning with an interview with Egypt's Vice President of Baker Hughes, to observe the industry and investment climate from the perspective of service companies.

The industry witnessed many events in December, beginning with the ICC arbitrary ruling, Egypt's clear direction towards renewable after COP21, the dilemma of factories and gas supply, and of course the prominent Intergas VII that brought together industry experts.

Finally, I would like to close this note with deep appreciation and gratitude to the Egypt Oil & Gas team. Every month you prove that you know no boundaries, and with every issue you prove that challenges only enhance your creativity and reach.

As always thank you for your readership, and may this year bring you joy, success, and happiness

Happy New Year

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EGYPT OIL&GAS NEWSPAPER

3rd Egypt Oil and Gas Technical Convention

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EOR / WATER FLOODING

TECHNICAL CONVENTION

Roundtable - Workshop - Training Course - Exhibition

20-23 MARCH 2016

Committee Exeutives Include

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Geol. Mostafa El Bahr
Former Chairman - Agiba Petroleum Company
Mr. Brian Twaddle
Country Manager & Director TransGlobe Energy
Eng. Abed Ezz El-Regal
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Dr. Ahmed El-Banbi
Professor - Cairo University

The convention identifies means to accesses additional reserves by enhancing and increasing oil production. With EOR and water flooding techniques, 30 to 60 percent ormore of the reservoir's original oil can be extracted compared to 20 to 40 percent using primary recovery.

Speakers from previous EOG Conventions include:

HE. Eng. Tarek El Molla, Minister of Petroleum
Mr.Arshad Sufi, BG Egypt Chairman
Mr. Sebstiano Burrafeto, ENI -IEOC Country Manager
Dr.Mahmoud Dabbous, IPR Group Chairman
Mr. Thomas Maher, Apache VP- General Manager
Mr.Maurizio Cortella, Edison General Manager
Eng. Hesham Ismail, Halliburton Vice President
Eng. Ahmed el Nakkadi, Schlumberger Vice President

What Executives Say About Egypt Oil & Gas

We commend this outstanding publication and wish it continued success in its journalistic mission to inform others about Egypt's petroleum industry and to communicate positively with foreign petroleum companies operating in Egypt.

SHERIF ISMAIL
Prime Minister

I consider Egypt Oil & Gas one of our critical tools enabling us reaching our success locally & globally.

TAREK EL MOLLA
Minister of Petroleum and
Mineral Resources

"Egypt Oil & Gas successfully brought together the leadership and technical experts from the government, IOC's, local companies and the service providers for three days of productive dialogue, lessons learned and technology transfer.
Thanks for your industry support Egypt Oil & Gas Team."

THOMAS MAHER
Vice-President & General Manager - Apache

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ICC Rules Against Egypt in Israel Gas Arbitration, Appeal Not Necessary

The International Chamber of Commerce (ICC) ordered Egypt to pay $2b in compensations for halted gas import to Israel due to a breach in the 20-year agreement signed in 2009, Reuters reported.

Egypt announced it would appeal the ruling over its alleged flawed nature on the grounds that Cairo had been forced to stop gas shipment in 2012 over security concerns, following a series of attacks against its gas pipeline in the Sinai.

Egypt's appeal over the dispute with the Eastern Mediterranean Gas and the Israel Electric Corporation would be based on a lack of jurisdiction by the ICC, as the contract between the parties had granted arbitration power to the Cairo Regional Center for International Commercial Arbitration instead, former EGAS Chairman, Mohamed Shoeb told Ahram Online.

According to later reports, a formal appeal may not be necessary, as the two sides were likely to reach a negotiated settlement. Israeli Prime Minister, Benjamin Netanyahu said that a negotiated solution is in both countries' strategic interest. An anonymous government official in Egypt confirmed information about pending negotiations, Daily News Egypt reported, as Israel lacked alternatives to the Egyptian infrastructure for its energy industry. Gas terminals in Jordan, Turkey, and Lebanon had been deemed unsuitable for Israel's interest.

Cairo will host an announced Israeli delegation to further negotiate the terms of the settlement directly with the Egyptian General Petroleum Corporation (EGPC) and the Holding Company for Natural Gas (EGAS).

As a result of the December ruling, the Egyptian government had frozen negotiations between Egyptian companies and Israeli gas fields and had suspended new gas import agreements with Israel, according to Daily News Egypt. Israeli companies were, however, reported as pursuing energy trade deals with Egyptian firms despite the freeze, United Press International wrote. Some firms such as Delek Energy, with a stake in Israel's Leviathan and Tamar fields projects, were reporting as stating that they were not a party to the current lawsuits and were therefore pursuing business as usual.

Earlier in November, an announcement was made that a preliminary deal was concluded between Israeli companies in the Leviathan Field and Egypt's Dolphinus Holding Company to supply natural gas to Egypt in 2020. Dolphinus had also reached a seven-year deal to buy $1.2b of gas from Israel's Tamar field earlier in the year. Resolving the lawsuit would allow Israel to export gas to Egypt, a primary client with existing infrastructure ready to import.

Eastern Libyan State Oil Company to Export Crude to Egypt

The state oil company, National Oil Corporation (NOC) of Libya's eastern government has completed a deal to sell 2 mmbbl of oil a month to Egypt, according to a company's press release, reported Egypt Independent.

A delegation from the eastern NOC headed by Chairman, Naji al-Moghrabi had visited Egypt and signed a deal for the crude shipment, training and exchanges related to the oil industry, Reuters informed.

The eastern NOC has sought to boost its efforts to win crude export deals without passing through the control of the Central Bank in the west of the country and the Tripoli-based NOC, which most foreign oil trading companies prefer to cooperate with, Libya Herald wrote. However, according to an official statement cited by Bloomberg, the western NOC has the right to take legal action against any party that tries to export crude or products from Libya without its permission.

Egyptian officials have not publicly confirmed the deal and the eastern Libyan oil company provided no further details.

The announcement comes a week after a delicate ceasefire and unity-government plan was reached between the internationally-recognized eastern government and the western government based in Tripoli. Both sides have been operating their own oil companies and banking systems, complicating the Libyan crisis.

EGAS Decreases Gas Imports, Restores Full Industrial Supply

The Egyptian Natural Gas Holding Company (EGAS) has fully reinstalled gas provision to energy intensive factories of approximately 906mcf/d, amid gas imports reduction to around 700 mcf/d from 1 bcf/d in November, Daily News Egypt reported.

The reduction was a response to declining domestic consumption that fell to 2.6 bcf/d in November, down from 2.85bcf/d. The gas capacity pumped to fertilizer plants has been restored to 100% of fulfillment of contractual obligations, after dropping to 85% due to reduced capacity in the national gas network, an EGAS official told El Borsa.

Fertilizer factories, among the highest consumers of gas, receive around 510 mcf/d of gas, according to an official quoted by Daily News Egypt. Abu Qir and Talkha factories receive 138 mcf/d and 67 mcf/d, respectively. EGAS transfers 45mcf/d to Misr Fertilizers Company, while Al-Masriya factories receive around 90 mcf/d. EGAS further provides 61 mcf/d of gas to cement factories, out of which 25 mcf/d are pumped to the National Cement Company, 25 mcf/d to the Helwan Cement factory, and 11 mcf/d to the El-Qatamiya Company.

The report stated that the estimated contractual amount of working natural gas plants in Egypt is 510 mcf/d, and the total amount of gas produced in Egypt is 4.12 mcf/d, with 850 mcf/d from imports.

Egypt Signs 24 Agreements with Renewable Companies

The Egyptian Ministry of Electricity has signed cost-sharing agreements with 24 renewable energy companies, which have qualified for the feed-in tariff program to build solar and wind power plants for total investments estimated at EGP 350m, Daily News Egypt reported.

The companies signing the agreement – including TAQA Arabia, Cairo Solar, Orascom, Lekala Power, and others - have committed themselves to paying EGP 9m of EGP 27m to link the new stations to the national grid, previously a point of contention, plus 12.5 % of additional costs.

Al-Masry Al-Youm wrote that the expected output of the solar stations in this agreement would be 1,800 MW, while steam-powered production would amount to 650MW.

The feed-in tariff program and other incentives for alternative energy projects are part of the Egyptian government's efforts to expand country's domestic energy production, conventional and alternative, to meet rising domestic demand.

In addition, Egypt is expecting to see 6$b in foreign direct investments for renewable energy projects over the next two years, an official with the Egyptian Ministry of Investment stated, informed Amwal Al Ghad. According to the 2014 program proposal, 4,300 MW of alternative power will be built in Egypt between 2015 and 2017.

Egypt has increased its renewable ambitions over the past year, and announced its plans to push for %20 of country's energy consumption generated from alternative sources by 2020.

In line with this strategy, Egypt has also opened up MENA's largest wind farm in the Gabal al-Zeit area near the Red Sea in December, estimated to bring between 150MW and 200 MW to the Egyptian electricity grid, and increasing its total capacity to 750 MW.

Meanwhile, the European Bank for Reconstruction and Development (EBRD) has allocated 500$m to finance solar energy in Egypt in 2016, according to Ahram Online, envisioning a boost to the construction of utility-scale solar projects by the private sector. The projects are estimated to generate up to 2,000 MW of the total capacity for a cost of 4$b, a Bank's statement read.

SkyPower IGD had announced a 5$b investment in solar panels to generate 3GW of power; Terra Sola stated it envisaged a 3.5$b solar plant investment; and ACWA and Masdar plan to generate a combined 3.5GW of renewable energy. TAQA Arabia has signed an agreement with the Egyptian Electricity Transmission Company and the New and Renewable Energy Authority to establish a 50MW solar power plant near Aswan worth 75$m.

CBE Unable to Meet EGPC Monthly Dollar Payment

The Central Bank of Egypt (CBE) is unable to provide the Egyptian General Petroleum Corporation (EGPC) with its monthly requirement of $700m to finance the import of petroleum products, natural gas, and to deliver payments of loans to foreign banks, reported Daily News Egypt.

EGPC had requested in total $2.4b in 2015 to be paid in $700m installments each month. However, the CBE allocated only $1.8b for this time frame. In October, the CBE provided the company with merely $160m, forcing the EGPC to continue paying the difference for the LNG import from its budget.

EGPC had been reported as seeking negotiations with banks to delay dollar payments it owes, Reuters wrote quoting an unnamed official, however, the company later denied the statement saying that it was on time with all due payments.

CBE is currently facing a foreign currency shortage due to the political and economic turnover since 2011 and its reserves have fallen from $36b to $16.4b in that period. Even though foreign currency reserves increased slightly to $16.414b in October, the bank was unable to release the full amount requested by the EGPC even in November, over fears of a downgrade in Egypt's credit rating, should reserves again fall.

BP Increases Stake in DEA

BP has increased its stake in Egypt's West Nile Delta gas project to %82.75, Ahram Online reported. As part of the deal, BP gained a further %22.5 of the North Alexandria Concession, and %2.75 of the West Mediterranean Deep Water Concession of the West Nile Delta.

The West Nile Delta Project agreement was signed already in March and included a concession of 5 tcf of gas, and 55 mmbbl of condensates. The area is expected to produce about 1.2 bcf/d of gas in total in 2017, which would represent about %25 of Egypt's overall gas production capacity.

The acquisition was announced after a German firm, Deutsche Erdoel AG (DEA) had sold a portion of its stake in the West Nile Delta, in an effort to reorganize and optimize its portfolio, keeping a share of merely %17.5, Egypt Oil and Gas reported. The company has completed the 'farm-down' with the approval of the EGPC, and the Egyptian Ministry of Petroleum to reorganize its risk. DEA stated that it "remains committed to Egypt's energy production and continues to work hard with our partner BP to put West Nile Delta on stream in time and budget."

Egypt to Add 3GW to Power Grid in 2016

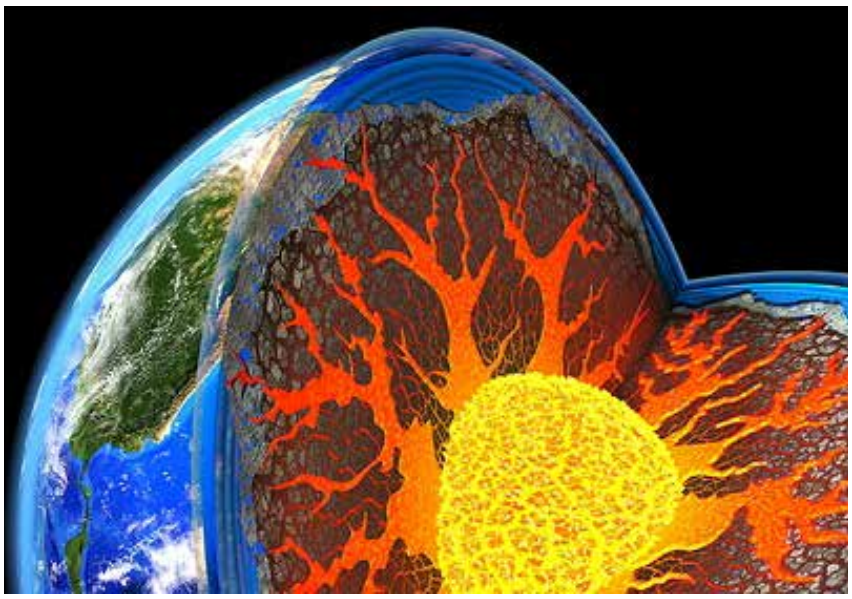
The Egyptian Electricity Ministry informed that Egypt would add between 2,000 MW and 3,000MW to the country's electricity generation capacity in 2016, Ahram Online reported.

Electricity Minister, Mohamed Shaker stated that the expansion would ease some of the rationing, which had led to power outages and had significantly cut industry supplies, as gas supplies for home consumers had been prioritized. Reductions in industrial fuel supplies have put pressure on Egyptian manufacturing, especially in the cement and steel sector. The ministry thus hopes to accelerate the expansion projects to aid the industries seeking to improve electricity supplies in the next summer.

The minister further stated that 6,882MW of the overall capacity had been added to the Egyptian grid since the beginning of 2015, aided by LNG imports. Egypt's total capacity in May 2015 was around 32,000MW, the Middle East Economic Survey estimated.

In addition, Egypt began renting two floating storage and regasification units (FSRUs) in 2015 to allow imports of liquefied natural gas and its conversion into natural gas for electricity generation, Reuters informed. A third FSRU is expected to become operational in Ain Sokhna by the end of 2016 or early 2017.

GANOPE to Develop Green Energy Projects



GANOPE, EGPC, and EGAS have signed a letter of intent with the European Bank for Reconstruction and Development (EBRD) that will finance a number of green energy projects in the country, reported Egypt Oil & Gas.

Head of GANOPE, Abu Bakr Ibrahim, told Egypt Oil & Gas that efforts were underway to exploit non-conventional energy sources and promote the use of renewable energy. Some projects focus on exploiting associated gas, produced with the extraction of oil, while others involve compound cycle compressors, utilizing the exhaust from compressors to be re-converted to energy. Abu Bakr added that the projects are in the studying phase and explained that the role of EBRD is limited to providing funding.

Meanwhile, GANOPE and Egypt's New and Renewable Energy Authority (NREA) were to sign a Memorandum of Understanding (MoU) aimed at harnessing geothermal energy to generate electricity. A committee was formed between the ministries of oil and electricity to frame mutual cooperation in the sector.

Abu Bakr further informed that GANOPE had also signed an MoU with UAE's Al Ain for the establishment of a package of projects with investments of about $5.3b.

The MoU envisages the construction of a power plant with carbon dye neutral to contribute to the development of the Gulf of Suez area. A feasibility study is currently being prepared to set up a power plant project using oily little girl in the Red Sea zone.

According to a statement by GANOPE, the company had already signed another MoU with the Emirati Inmaa Al Ain for Development and Investment for the establishment of slew of economic projects in the Gulf of Suez annex worth $3.5b in total. At the forefront is a power plant project characterized by a low carbon-footprint that will help develop the area. He added that a feasibility study was underway to determine the economic viability of setting up a tar sands power plant in the Red Sea zone.

In addition, EBRD had announced its first loan to Egypt worth $170m directed towards strengthening safety and environmental standards in the country's energy sector. The loan was arranged in cooperation with the Islamic Development Bank, the Arab International Bank, Al Ahli Bank of Kuwait, Credit Libanais S.A.L., Alex Bank, and the Federated Project and Trade Finance Core Fund.

ENI's Zohr is Expected to Produce Only 22tcf of Gas

The Egyptian General Petroleum Corporation (EGPC) agreed with Italy's ENI that the Zohr giant gas field needed to enter into production to help bridge the gap between production and consumption in Egypt, EGPC's Chairman, Mohammed Al-Masry, told Egypt Oil & Gas.

Al-Masry explained that preparations for extraction would begin in mid-December 2016. He added that between 22tcf and 26tcf of gas is expected to be extracted from the field, noting that drilling will start at the beginning of 2017.

EGPC is still to conclude negotiations over the price of the gas from the field amidst consistent disagreement over the amount of investment needed for the field. While EGPC estimates that Zohr project requires $14b in total investment, ENI stated the amount of $16b, according to Al mal News.

Minister of Petroleum, Tarek El Molla said that the petroleum sector had a plan for the development of fields, increasing the number of wells, intensifying exploration, and encouraging investment from foreign partners in order to insure that rising production rates keep pace with growing needs.

The gas agreement further stipulates that Egypt has the right to buy all of the foreign partner's share, amounting to 40%, after partners are reimbursed for their drilling costs.

DRILLING

KHALDA

KHALDA, a joint venture company between EGPC and Apache, has completed drilling new oil-development and oil-exploration wells in its concession area in the Western Desert. The production rate of KHALDA was 4,615,926 barrels of oil as of November 2015.

NRZK18-

The development well was drilled at a depth of 11,500ft. utilizing the ST6- rig. Investments surrounding the project are estimated to be 1.796$m.

W.KAL A13-

The development well was drilled at a depth of 11,260ft. utilizing the EDC-16 rig. Investments surrounding the project are estimated to be 1.230$m.

RAS KAN 25X(ST)

The exploration well was drilled at a depth of 15,254ft. utilizing the EDC-57 rig. Investments surrounding the project are estimated to be 3.156$m.

QARUN

QARUN, a joint venture company between EGPC and Apache, has completed drilling new oil-development wells in its concession area in the Western Desert. The production rate of QARUN was 1,118,273 barrels of oil as of November 2015.

EBS29-

The new well was drilled at a depth of 7,750ft. utilizing the EDC63- rig. Investments surrounding the project are estimated to be 850,000$. It is worth noting that the well is being placed on production.

WON C303-

The new well was drilled at a depth of 8,800ft. utilizing the EDC63- rig. Investments surrounding the project are estimated to be 1$m. It is worth noting that the well is being placed on production.

ED73-

The new well was drilled at a depth of 6,300ft. utilizing the EDC64- rig. Investments surrounding the project are estimated to be 800,000$.

KUWAIT ENERGY

KUWAIT ENERGY, an oil and gas exploration company, has completed drilling new gas-development well in its concession area in the Eastern Desert.

YUSR63-

The new well was drilled at a depth of 4,724ft. utilizing the ECDC1- rig. Investments surrounding the project are estimated to be 500,000$. It is worth noting that the well is being placed on production.

GPC

GPC, a public sector company, has completed drilling new oil-development wells in its concession areas in the Western and Eastern Deserts. The production rate of GPC was 1,212,290 barrels of oil as of November 2015.

HF 7/36A

The new Western Desert well was drilled at a depth of 7,930ft. utilizing the ST4- rig. Investments surrounding the project are estimated to be 2$m.

AMER75-

The new Eastern Desert well was drilled at a depth of 4,757ft. utilizing the ST9- rig. Investments surrounding the project are estimated to be 1.500$m.

PETROSANNAN

PETROSANNAN, a joint venture between EGPC and Ukraine's Naftogaz, completed drilling a new oil-producing developmental well in their concession area in the Western Desert. The production rate of PETROSANNAN was 218,494 barrels of oil as of November 2015.

AESE 9/1 6

The well was drilled at the depth of 6,768ft. utilizing the SHAMS2- rig. Investments surrounding the project are estimated at 2.288$m. It is worth noting that the well has already been placed on production.

AGIBA

AGIBA, a joint venture company between EGPC and IEOC, has completed drilling a new oil-development well in its concession area in the Western Desert. The production rate of AGIBA was 1,979,936 barrels of oil as of November 2015.

MEL89-

The new well was drilled at a depth of 6,300ft. utilizing the PDI147- rig. Investments surrounding the project are estimated to be 1$m. It is worth noting that the well has already been placed on production.

NORPETCO

NORPETCO, a joint venture between EGPC and Sahari oil company, has completed drilling a new oil-development well in its concession area in the Western Desert. The production rate of NORPETCO was 297,802 barrels of oil as of November 2015.

N.SILAH D2-2

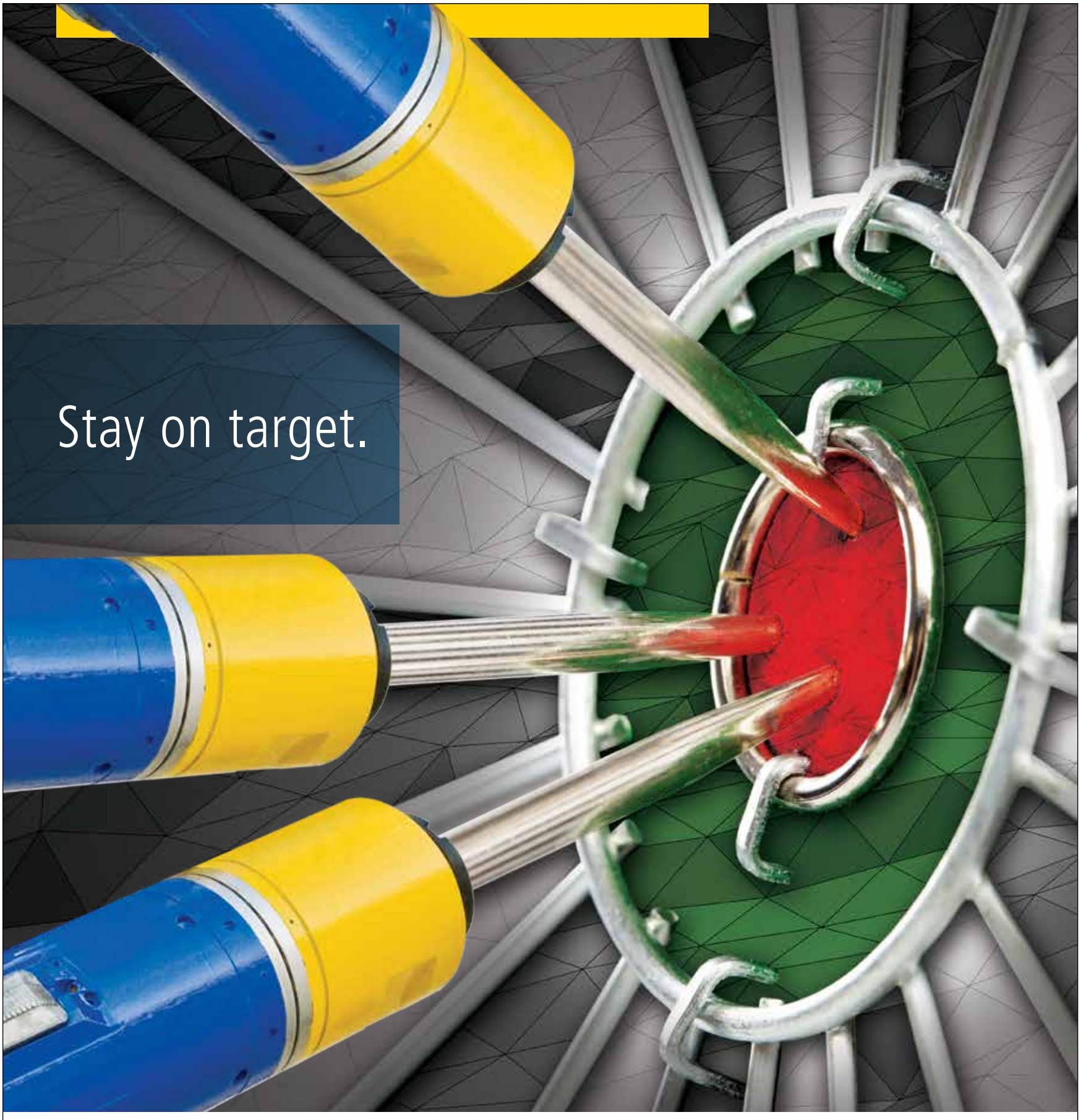
The new well was drilled at the depth of 8,210ft. utilizing the TANMIA1- rig. Investments surrounding the project are estimated at 2.023$m. It is worth noting that the well has already been placed on production.

TRANSGLOBE

TRANSGLOBE has completed drilling a new oil-exploration well in its concession area in the Eastern Desert during the 2015/2014 fiscal year.

NWG7-X

The new well was drilled at a depth of 4,500ft. utilizing the EDC67- rig. Investments surrounding the project are estimated to be 1$m. It is worth noting that the well is being placed on production.



Libyan Peace Deal Raises Hopes for Oil Production, Threats Loom

The UN-backed peace deal signed between Libya's two rival factions on December 17th is reviving hopes that shuttered oil fields and export terminals may be reopened, reported Al Jazeera.

The deal comes after a year in which two opposing camps, the Tripoli-based General National Congress in the West, and the House of Representatives in the Eastern city of Tobruk, each with its own legislature and armed allies, tussled over oil and power.

Following the peace deal, the National Oil Corporation (NOC) affiliated with the internationally recognized government in eastern Libya announced it would sign agreements with six companies to sell crude oil, according to Gulf News.

Experts consulted by Bloomberg said that even with the peace deal, the North African nation would struggle to restore its oil production to the pre-2011 levels.

In addition, they explained that Libyan output would further feed a glut that had caused oil prices slump by more than 65% since June 2014. According to analysts at the Energy Aspects Ltd., a lasting peace deal may allow Libya to ramp up its output, but a threat from Islamic State, reportedly situated in the oil-producing Sirte region, may worsen the situation.

Wintershall Holding GmbH, which operates 8 onshore oil fields in the eastern Sirte Basin, said it would take time and patience for Libya to find stability. Wintershall was forced to suspend its oil exports from the As-Sarah field in November, because the Zueitina terminal was unable to load cargoes.

According to Standard Chartered Plc, it is a long way from signing an agreement between the two rival governments to the restoration of the Libyan oil industry to its full capacity, as there still exist splits within the regional governments and their affiliated insurgent groups, Bloomberg informed.

The rival factions, that emerged after the 2011 uprising against Muammar Qaddafi's 42-year rule, agreed to end years of violence. However, according to observers cited by Al Jazeera, concerns remain about the willingness of the existing armed groups on the ground to comply with the terms of the deal.

The ongoing strife has slumped country's oil output by almost 80% since 2011. According to data compiled by Bloomberg, Libya pumped 375,000b/d in November 2015. The Central Bank and state oil company have been facing difficulties to manage economy of the country heavily dependent on crude, Reuters reported.

Libya has had two national oil administrations since 2011. The NOC in the West is recognized as the official marketer of the Libyan oil by traders such as Glencore and Vitol Group. The Eastern government has set up a separate NOC administration, which represents Libya in matters relating to oil including the Organization of the Petroleum Exporting Countries (OPEC).

If the peace deal goes through and a unity government and national army are formed, the international community will provide assistance in dealing with Islamic State, news agency Reuters explained.

Israel Approves Leviathan Gas Field Development

Israeli Prime Minister, Benjamin Netanyahu, signed a deal giving final approval for the Leviathan gas field development, reported Reuters. He described the project as critical to national security interests, dispelling claims that placing the country's largest gas reserves under the control of a single group of companies will limit competition. Texas-based Noble Energy and Israel's Delek Group – that discovered the gas field in 2010 – will retain the control of the field, but have to sell smaller assets.

Globes cited a press release by Noble explaining that it was still making assessments and revising capital requirements concerning the development of Leviathan, and would publish a final decision before the end of 2016. The approval came after deliberations in the Knesset Economic Affairs Committee, during which Governor of the Bank of Israel, Karnet Flug said that natural gas revenue estimates had shrunk by about 40%. Israel was reported to have successfully tested an advanced surface-to-air missile to play a crucial role in securing the country's offshore gas fields within two years and to extend its aerial defense against Russian-made Yakhont missiles allegedly held by Hezbollah, an unnamed Israeli military official said, according to The Guardian.

Kuwait's LNG Import on Rise

Kuwait's liquefied natural gas (LNG) imports was expected to rise by 17 % to 3m tones in 2015, up from 2.5m in 2014, boosted by the fuel's growing competitiveness with gas oil, reported Reuters. According to Zawya, Kuwait is a seasonal LNG importer, leasing a floating storage and regasification unit (FSRU) from a Norwegian shipping company, Golar LNG for peak energy demand period from March to November. Kuwait Petroleum Corporation's (KPC) Manager for Naphtha, Mogas, and LPG Sales, Khaled Al-Sabah said that the extension of the lease, which was due to expire in 2019, was being explored to cover additional off-peak months. Al-Sabah added that the use of both floating and land-based terminals was being studied with an ambitious plan to expand Kuwait's power capacity. The operation of the onshore LNG-terminal is due to start in 2020.

Riyadh Joins Global Green Energy Initiative

Saudi Arabia's Minister of Petroleum and Mineral Resources, Ali Ibrahim Al-Naimi, has joined more than 20 world leaders at the Paris Climate Change Conference to announce launch of a global initiative 'Mission Innovation' that commits governments to double public investments in clean energy innovation over the next five years, Trade Arabia and Washington Post reported.

Al-Naimi said: "The kingdom has a strong focus on clean energy research, and innovation. Our efforts include the development of a road map for technology, and research in the field of carbon management from all stationary and mobile sources, and its utilization in industrial areas, and for enhanced oil recovery. The kingdom also invests in the development and implementation of energy efficiency technologies, and in renewable energy sources such as solar and wind energy." Microsoft billionaire Bill Gates, in partnership with other prominent public figures and investors including Saudi Prince Al Waleed bin Talal, as the only Arab member, has launched a Breakthrough Energy Coalition to negotiate financing of clean energy by the private sector, Al-Bawaba wrote.

Jordan Launches Ambitious Wind and Solar Projects

Abdul Latif Jameel Energy and Environmental Services, and its portfolio company Fotowatio Renewable Ventures (FRV), have signed a power purchase agreement (PPA) for a planned 50 MW solar PV power plant in Jordan, reported Trade Arabia.

The PPA is valid for 20 years at $6.93 per KWh rate, providing 1% of Jordan's overall generation capacity. It will supply 155KWh of electricity per year, sufficient to power over 40,000 average homes in the country. Jordan also launched the region's first utility-scale wind power plant, the 117MW Tafila project to displace 235,000 tons of carbon dioxide emissions annually, reported Trade Arabia. The wind power plant, developed by the Jordan Wind Project Company (JWPC), is directly connected to the national grid and it will produce 400GWh of electricity annually. According to PR Newswire, the Tafila Wind Farm was developed in response to the 2010 renewable energy law,

calling for around 10% of electricity to come from renewable sources by 2020, including 600 MW of installed solar photovoltaic's (PV). The project is expected to stimulate renewable investments in the region.

Jordan imports around 96% of its energy needs at a cost equivalent to 20% of the country's GDP.

Iran Cleared of Nuclear Suspicions, Trades Yellowcake with Russia

The Vienna-based International Atomic Energy Agency (IAEA) announced that it had ended its 12-year-long investigation into concerns that Iran might be developing nuclear weapons, as no evidence was found since 2009, reported BBC News.

The agency reached the conclusion that Iran had conducted nuclear weapons related research in the past until 2003, and to a lesser extent until 2009. Iranian Foreign Minister, Javad Zarif welcomed the IAEA announcement saying that it confirmed the peaceful nature of Iran's nuclear program.

"This resolution goes far beyond closing the issue of so-called PMD (Possible Military Dimension) and cancels the 12 previous resolutions of the council of governors of the IAEA, which seriously restricted our country's nuclear program," he added.

According to Press TV, the approved resolution stated that the investigation had been implemented in accordance with the agreed schedule, and that this closed board's considerations of the matter. The vote for the resolution by the 35-member governing body of the IAEA was overwhelming. The resolution was submitted by the P5+1 group of countries on December 7th, following the July 2015 Joint Comprehensive Plan of Action (JCPOA) deal.

Shortly after the decision was announced IAEA Director-General, Yukiya Amano was quoted by Reuters as saying that Iran's ambition to have sanctions removed in January is "not impossible".

He explained that Iran was racing ahead with the required nuclear restrictions that included reducing the number of centrifuges installed at its underground enrichment sites, removing the core vessel of a reactor at Arak, and shrinking its stockpile of enriched uranium. Amano indicated that the agreed January deadline could be met, however, did not reveal how long the agency would need for its verification.

In related news, Press TV reported that the Head of the Atomic Energy Organization of Iran (AEOI), Ali Akbar Salehi, had revealed that his country had received Russia's consignment of yellowcake. In exchange, Russia is to receive nine tons of Iran's low-enriched uranium within days in accordance with a deal reached in the framework of the Joint Comprehensive Plan of Action (JCPOA) in July, he added.

Salehi explained further that since Iran could not stockpile more that 300kg of enriched uranium each year, it should either dilute its extra enriched uranium or sell it to other countries.

Russian President, Vladimir Putin signed a decree lifting the ban on supplying Iran with equipment for uranium enrichment in November. According to Putin's decree, "The ban on supplying goods, materials and equipment no longer applies to the exports of the enriched uranium from the Islamic Republic of Iran."

Under the JCPOA, Iran's nuclear activities will be limited in exchange for, among other things, the removal of all economic and financial bans against the Islamic Republic.

Turkey's Nuclear Reactor on Track despite Rift with Moscow

Turkey's President, Recep Tayyip Erdogan, said that the rift between Turkey and Russia over the downing of a Russian fighter jet, which was followed by diplomatic tension and Moscow-imposed trade sanctions on Ankara, would not harm the construction of the Akkuyu nuclear power plant, according to Anadolu Agency.

Turkey's first nuclear power plant is to be built by Russian Rosatom at a cost of $20b in the southern province of Mersin on the Mediterranean coast. "There is no indication that mega projects or large scale energy infrastructure projects will be halted or paused," Erdogan said.

International Business Times quoted Erdogan as saying that "there is no sign yet that the problems with Russia will affect projects like natural gas and the Akkuyu nuclear power plant."

He insisted that Turkey was firm on its stance on Russia and was looking to other energy suppliers to guarantee the country's independence. "Besides Russia, Turkey has natural gas

agreements with Iran, Azerbaijan, Nigeria, Qatar, and Algeria," Erdogan said.

Turkey's annual natural gas consumption is around 50 bcm, with 55% of the natural gas imported from Russia, and 18.1% from Iran.

Dubai to Invest in Clean Energy Strategy 2050

Dubai has launched its Clean Energy Strategy 2050 with billion-dollar investments in generating clean energy, Trade Arabia reported. The strategy is to initiate installation of solar panels on the roofs of all buildings and link them to local power utility already by 2030. The three-fold strategy will increase investments in technological innovations, shape legal framework promoting cooperation between municipalities and building owners, and establish the Dubai Green Fund for low-cost loans for investors. Dubai's clean energy is expected to increase to 7 % by 2020, 25 % by 2030 and 75 % by 2050. Dubai's ruler, Sheikh Mohammed bin Rashid Al Maktoum, explained the aim of the strategy: "It aims to provide 75 % of the Emirate's energy through clean energy sources by 2050, reflecting our commitment to establish a sustainable model in energy conservation, which can be exported to the whole world, and support economic growth without damaging the environment and natural resources." Dubai intends to create a tax-free business zone to attract clean energy investors internationally.

UAE's Mubadala Strikes Deal with China National Petroleum

The UAE's Mubadala Petroleum and China National Petroleum Corporation (CNPC) have signed an oil and gas exploration and production co-operation agreement, reported Arabian Business.

Apart from upstream projects, the cooperation also includes onshore conventional projects, offshore projects, and LNG projects outside of the UAE. Mubadala Petroleum's operation portfolio in South East Asia is reported to be growing. It is the second largest black oil producer in Thailand with several other appraisal and development projects in the region. According to Trade Arabia, the non-binding strategic co-operation agreement was signed by CEO Energy, Mubadala Development Company, Dr Sultan Al Jaber, and CNPC Chairman, Wang Yilin in Beijing during an official visit by Sheikh Mohammed bin Zayed Al-Nahyan, the Crown Prince of Abu Dhabi.

Nuclear Power as Boon to GCC's Energy Independence

Saudi Arabia's and UAE's ambitious nuclear power programs could benefit all members in the region over increasing energy interconnectivity, Utilities ME reported quoting the Assistant Secretary General of the Arab Union of Electricity, Mohamed Al Sadeqi, Speaking at the Third Arab Forum on the Prospects of Nuclear Power for Electricity Generation and Seawater Desalination in Manama.

Bahrain's Energy Minister, Dr. Abdulhussain Mirza, said that nuclear power has proven its reliability in terms of safety and security, being free of greenhouse gas emissions, and competitive in costs. He added that alternative sources of energy should also be pursued, Bahrain News Agency reported.

The minister explained that the region has a desire to ensure its energy self-sufficiency via a peaceful use of nuclear energy with an aim of meeting growing energy demand amid depletion of natural resources. Al Sadeqi promoted nuclear power longevity in comparison to conventional fossil fuels, but added that Bahrain was not yet ready to build a nuclear power complex.

According to Al Bawaba, there are more than 438 nuclear plants in 31 countries worldwide; however, only four Arab states have a clear nuclear program, among them Egypt and Jordan

US Lifts 40 Year Oil Export Ban

US Congress has approved a deal to lift the 40-year-old ban on US crude exports to allow American oil producers to sell their products in the global market without restrictions. The lift came after a decade of agitation by major US oil firms, responding to technological advances the industry has made in drilling and fracking, which have opened up untapped reserves of crude oil and natural gas – making the US the world's third-largest producer.

The provision lifting the ban is to expire at the end of 2021 and is valued at $1.9b in total over the next ten years, according to an analysis published by the Joint Committee on Taxation, cited by Bloomberg. In another report, Bloomberg explained that the legal provision would allow independent refiners to exclude 75% of oil-transportation costs from their pre-tax net income. Some refiners processing crude into gasoline and diesel will get a tax break worth $119m in 2016 on the cost of oil shipment.

Some analysts believe the current provision may unleash a flood of oil from US shale fields, especially to Latin America and Europe, while others state that the lift will change little in terms of American energy security and export volumes. They say the real benefit to American oil companies is that the ban being lifted reduces the artificially low price of West Texas Intermediate compared to Brent. However, American oil will be met by an already-saturated global oil market, where prices have collapsed by around 67% in the past 18 months. American opponents of the move say it may be harmful for consumer prices, the environment and refining jobs.

There has been little comment on the move by major oil producing states, but there is undoubtedly a political component to the lift, as some American antagonists, notably Russia, Iran, and Venezuela are feeling economic pain of low oil prices. "We have the best technology, the best oil, and over time we will drive out Russian oil, we will drive out Saudi, Iranian," said Republican Congressman Joe Barton of Texas.

The White House announced its support for the export lift despite initial objections, Bloomberg reported. This is in part due to the green energy tax incentives that came with the export ban being lifted. These benefits include a five-year extension of tax credits for renewable power producers and a 30% tax credit on investment in new solar and wind products. Further, companies seeking to earn these credits will be required only to start construction on projects, rather than complete them, during the fiscal year.

$1 Trillion Needed to De-carbonize the Global Economy

At the UN Paris climate change conference (COP21), 195 countries reached an unprecedented accord to commit nearly all states to lowering greenhouse emissions aiming at decreasing dangerous climate change effects, Bloomberg reported.

The Paris pact calls for a regular review of countries' pledges every five years, with an aim to limit the global average temperature rise to 1.5°C above pre-industrial levels, The Washington Post wrote. The deal has triggered a fundamental shift toward zero-carbon energy production shunning away investments in coal, oil and gas as primary energy sources.

According to Bloomberg, governments and businesses are counting the costs and benefits of the concluded agreement, while fossil-fuel producers and countries dependent on fossils are awaiting a massive costly disruption. Nevertheless, fossil fuels will still account for about 75% of energy demand in 2030, with coal hitting a plateau, and natural gas surging, according to the International Energy Agency.

The UN estimates that $1t in spending is required to de-carbonize the global economy, and prevent temperature rises that are threatening to flood coastal areas, and destroy ecosystems.

Developed countries pledged to give $100b a year of clean energy funding to the developing world by 2020, wrote Reuters.

OPEC Projects Oil Price Rise in Early 2016

OPEC announced that global crude oil prices, currently at the seven-year low, could rise in under a year time amid cuts in oil output from some producers, Reuters reported, quoting Secretary-General, Abdullah Al-Badri. Crude prices have dropped to the lowest level since 2004 of $36 a barrel at the end of 2015. The current global oil production of 2mb/d above demand has generated oversupply in an attempt to drive higher-cost producers such as the US shale out of the market. OPEC is prepared to hold an urgent meeting if prices do not recover by February, RT wrote. Oil output is likely to decline in the upcoming years as the oil industry has seen investment cuts of up to $130b in 2015, Al-Badri said. The announcement comes weeks after the December OPEC Summit, where both Iran – following removal of sanctions, and Saudi Arabia said they would keep on pumping in 2016 despite global supply glut, which OPEC failed to curb, according to Bloomberg.

Mexico Offers its First Deep-Water Exploration Blocks to Bidders

Mexico is offering its first deep-water oil and gas exploration blocks to bidders as part of the historic energy industry overhaul that will open the sector to private investment, Fox News Latino reported.

The Secretary of Energy said that 10 blocks would go up for bid in September 2016, four of them in the "Lost Belt" in the Gulf of Mexico, the maritime boundary between Mexico and the US. The auction is scheduled for late 2016 to allow companies to analyze the projects.

Since its 2014 reform that ended seven decades of state monopoly on the oil business, Mexico has been awarding exploration and production contracts only on land and in shallow water, according to ABC news.

Meanwhile, country's oil regulator has awarded all 25 onshore oil contracts on offer in an auction aimed at boosting new Mexican oil companies after having finalized the sector reform last year putting an end to the state-run Pemex's dominance on the market, Reuters reported.

"This is a triumph for Mexico," Juan Carlos Zepeda, President of Mexico's oil regulator CNH said after the auction. The expected production capacity of the 25 fields is 77,000 b/d with estimated future investment of $1.1b.

Turkmenistan Launches $10b TAPI Gas Pipeline

Turkmenistan has begun construction on the long-discussed TAPI pipeline, which would pump natural gas from Turkmenistan through Afghanistan and Pakistan to India, Reuters reported. The 1,735km pipeline is expected to cost $10b and transport 33bcm/year of gas. The TAPI pipeline is to have a total gas capacity of 90mscm/d in the next 30 years, The Indian Express writes. The government stated the project would be completed by the end of 2018.

Turkmenistan boasts the world's fourth largest gas reserves, which it exports almost exclusively to China. TAPI is designed to help ease energy deficiency in South Asia, which in turn may help Turkmenistan reduce its dependence on China and Russia, The Express Tribune reports.

The markets of India and Pakistan have long-been desired by the reclusive country, but instability, security, and price concerns have stalled the effort.

Affected states have touted the project as a step towards greater regional political and economic cooperation. "The TAPI gas pipeline project will help promote peace and trade among the regional countries," Pakistani Prime Minister, Nawaz Sharif said at the opening ceremony. Indian Vice President, Mohammad Hamid Ansari, added that TAPI was "the first step to the unification of the region."

Nigeria to Cut Fuel Subsidies amid Lower Production, Calls for Deregulation

Nigeria plans to reintroduce the old petrol price of $0.49 (N 97) per liter in 2016 in line with the country's policy to cut oil subsidies amid the global oil price slump, Premium Times reported.

According to Nigerian Petroleum Minister, Ibe Kachikwu, the economy can no longer support the current price of $0.44 per liter. The Nigerian National Petroleum Corporation (NNPC) stated that fuel subsidy spending had proven unsustainable, and that the people were better served by introducing subsidies for other state services such as education or transportation.

The news comes as Nigeria's daily production has seen a fall to 250,000 barrels in November, moving the country to Africa's second-largest producer after Angola, This Day Live reported.

Meanwhile, the Nigerian National Petroleum Corporation (NNPC) advocated for a full deregulation scheme of the downstream sector of the oil and gas industry. NNPC's position paper on the subject stated that the deregulation measures would allow market forces to determine the prices of products, while creating savings for the government. The move would ensure that the Department of Petroleum Resources (DPR) and the Petroleum Products Pricing Regulatory Agency (PPPRA) continue regulating the sector, including profiteering by marketers, under a deregulated regime.

Solar Energy: The Jewel in the Crown

By Tamer Abu Bakr
Chairman of the Energy Committee of the Federation of Egyptian Industries (FEI).

Egypt's new direction towards diversifying the energy mix in favor of renewable energy is one of crucial importance. In the new arrangement renewable energy would make up 20% of the country's total generated electricity by the year 2020.

This consideration is making us all join together in efforts to avoid future crises by relying on our expertise in energy and renewable fields, investment, and strategic planning. A plan must be hastily devised, and executed for the maintenance of our crumbling power stations. This alone will cost $12b, at least, for their restructuring and repair to eliminate the power crisis. Weak production in the electricity sector was the main reason why electricity shortages return to Egypt from time to time. They result from the fact that there is a 500 MW deficit per month, especially in the summer.

The current state of electricity distribution is stable, but other crises could return if exploration and production of natural gas was not boosted. No country could advance economically without securing its electricity production, therefore a search for other sources of energy is ongoing. Renewable energy plans have not really been implemented on the ground until now, except for a small number of government buildings and facilities. Another problem is the need to rationalize consumption and free up gas for power plants.

The ultimate solution for the electricity crises in Egypt is through the rationalization of consumption, and the use of LED lamps in all homes to quickly eliminate the crisis. It couples with an expansion of signed agreements for the establishment of solar power plants. These plants are the best solution for Egypt, especially as they are the future, and will help us avoid many crises in the coming years. They will also help us provide all of the daily gas production needed for power plants that enjoy 10% higher consumption rates per year.

The cost of setting up a new solar power station will amount to not more than $100m. In addition, larger savings will come from billions of dollars normally paid for LNG, saved thanks to long-term contracts. The real problem resides in the cost of linking these new power stations to the national grid, which itself needs monthly maintenance and infrastructure restructuring. Speedy solutions had to be found to be able to save gas and contribute to easing energy subsidies' burden.

Solar energy projects designed for houses' rooftops will also help us to ease the pressure on the power grid, adding to electricity production itself. Solar projects in general demand contracting international companies, along the lines of what happened in Japan, China, and America, the countries which were freeing up natural gas to build up their strategic reserves by using new alternative energy sources. Solar power plants are complete facilities that may replace new conventional facilities.

The use of solar energy at government's facilities will help increase the production capacity of factories and industrial companies, resolving the gas shortage crisis for factories, which are intensive and medium gas consumers. The widespread usage of coal will also accelerate the return to the production levels in the manufacturing sector that will spur the economic growth.

The Reality of Diversifying Egypt's Energy Mix

By Dr. Magdi Nasrallah
Founder and former Schlumberger Chair Professor, Department of Petroleum and Energy Engineering, The American University in Cairo.

The main source of electricity in Egypt is power plants running on natural gas for the most part; however, mazot (or fuel oil) is used as a substitute due to the recurring natural gas shortages. The latter is more polluting and power plants have encountered serious corrosion problems because of its relatively high sulphur content. These problems, in addition to a lack of adequate maintenance, result in reduced power generation. Our power plants are designed to produce about 32,000 GW; however, the current energy production does not exceed 22,000 GW, which is insufficient for the country's current increasing needs. Furthermore, Egypt imports LNG and mazot at international prices, and sells it domestically at highly subsidized rate. As a result, both the internal and external debt is increasing. The Ministry of Petroleum (MOP) is currently indebted around EGP 180b due to the subsidies. This situation cannot continue and the government is finally realizing that an energy mix represents a reasonable solution to our problems. While Egypt is considering expanding its energy mix, there is still a high potential for significant discoveries in the Mediterranean deep waters, the Delta and the Western desert.

Alternative sources of energy being considered include coal, solar, wind, and nuclear. Coal is a relatively recent addition for the operation of energy intensive industries such as cement and steel; however, environmental issues are of concern.

The government is exerting an effort to emphasize solar and wind power; however, it is almost impossible for these resources to compete or substitute natural gas due to the subsidies. A reasonable mix will include 40% fossil fuels, 30% coal, 15-20% nuclear, and a balance between wind/solar energy. The government claims that 20% of the energy in Egypt will be solar and wind-fueled within the next ten years. This is only possible through incentives including tax breaks, custom duties reductions, as well as subsidies similar to those provided to fossil fuels.

In my opinion, solar is an extremely promising resource, and the government must seriously consider building solar towers, encouraging the private sector to develop solar photovoltaics, and promoting connections to the national grid. Nuclear is another source that will finally see the light after a protocol with Russia is signed in order to develop four reactors in the Dabaa area for a generation of 4,800 GW. The details of the agreement are not clear, but I hope that this contract will include the following critical issues: Egypt must have an access to nuclear fuel after the termination of the contract; the country should be allowed to develop its Uranium enrichment technology for electrical applications only, but not for nuclear weapons. In addition, I hope that this technology is the fast breeding type, which means that Uranium enrichment will occur during the operation itself; the excess of thermal energy can be used for water desalination; and finally, disposal of nuclear waste must be the responsibility for the Russians.

The 3 Solutions to Egypt's Electricity Crisis

By Dr. Ibrahim Zahran
Former Chairman of Khalda Petroleum Company, and Petroleum Expert

The Egyptian government could face a return of the electricity crises during the next summer season. Power to Egyptians, especially those of low income families, is as important as bread, and plans should be set to deal with this eventuality.

A more decisive vision when dealing with the power crisis needs to be established, identifying causes, and building a road map for the coming years. There is considerable confusion in the plans for the rationalization of energy subsidies, and the provision of fuel for power stations.

A main cause is the numerous power plants that are operating by a fuel that is not available, which is forcing the government to import at global prices. In the summer 90% of Egypt's gas production is directed to electricity generation, in comparison to just 62% in the winter period; in addition, Egypt imports at least 40% of its petroleum products per month to meet the needs of local consumption.

A major reason behind the current crisis is the amount of contracts signed to export natural gas during Mubarak's era.

Energy subsidies have reached EGP128b, which are in part due to the gap between production and demand, but mostly due to the need to purchase the remaining quantity at global prices. It is expected that Egypt will continue to suffer from an accumulated electricity crises for the coming 3 years, due to a power production gap of 500 MW below consumption.

Three main solutions are recommended to resolve the power crisis in Egypt once and for all. First, the diversification of energy sources, and the use of solar and wind power, saving billions of dollars a month allotted to gas imports for power plants. Secondly, factories should import their own needs to ease pressure on the Ministry of Petroleum, and allow it to conserve gas, on condition that most of the output goes to power plants only. Finally, the Ministry of Electricity pursues the following energy mix: coal 20%, nuclear 10%, new and renewable energy 20%, while remaining 50% should rely on high quality natural gas.

The role of citizens in the plan for energy conservation should be prominent, beginning with their homes and workplace. The Egyptian government should help increase the commitment of regular citizens by establishing a law enforcing the mentality of consumption rationalization through financial penalties.

Service Companies: Between Innovation and Oil Prices

An Interview with Baker Hughes Vice President, Jerome Jammal, to explore the pressure of dropping oil prices on the current climate for service companies.

By Nadine Abou el Atta

In today's oil industry, innovation is paramount to staying ahead, especially when it comes to service companies. Currently the Egyptian petroleum industry is presenting a challenging climate for service companies in particular; to better understand the whole picture, Egypt Oil & Gas sat with Mr. Jerome Jammal, Vice President of Baker Hughes.

Baker Hughes is one of the world's largest oil field services companies, operating in over 90 countries, and providing the industry with products-services for oil drilling, formation evaluation, completion, production and reservoir consulting.

Technological innovation is at the core of Baker Hughes DNA. Baker Hughes is the combination of several leading technology companies that have developed and introduced technology to serve the petroleum service industry in Egypt, and around the world. Its combined history dates back to the early 1900s. "During its history, Baker Hughes has acquired and assimilated numerous oilfield pioneers to ultimately achieve the company purpose: The simple statement, 'Enabling safe, affordable Energy, improving people's Lives' articulates who we are, reflects what the company stands for, and encapsulating the driving force behind everything that we do" said Jammal.

Jammal explained that energy, along with food, water, and shelter, contributes to a better quality of life for people, hence the presence of 'improving people's lives" in their vision.

"Our strategy for delivering on our purpose is simple; value for our company, for the energy industry, for our shareholders and for the communities in which we work through. Efficient wells, optimized production, and improved ultimate recovery," he continued "every major oil and gas play exhibits a unique physiology and demands a tailored approach. In Egypt, Baker Hughes is helping customers to develop energy reserves with the latest technologies at a cost-effective manner, in a safe and compliant environment, and with the best-in-class people."

"Every major oil and gas play exhibits a unique physiology and demands a tailored approach."

Achievements in Egypt

"Being the largest non-OPEC oil producer in Africa and the second-largest dry natural gas producer on the continent, Baker Hughes fully understands the strategic role of Egypt in Africa and the Middle East Region. Egypt is an important country for Baker Hughes business, being driven by stable levels of activity, as well as maturity of business style. Egypt has had one of the highest drilling and workover environments in Africa. We have been a major player and partner in the industry throughout the full cycle for decades, and we continue to invest in our people and technology to support the demands of our customers in the country," said Jammal.

When asked about the company's major achievements in Egypt, Jammal answered "Baker Hughes has been a leader in providing operators in Egypt with advanced technology solutions, helping operators save cost, and enhance production in a safe manner. Our company is renowned by its high-tech drilling evaluation solutions which made it possible to drill the first horizontal well in the Mediterranean, achieving all the customer's objectives, by precise steer and land the well as per plan, then drilled 485m horizontally in the reservoir."

Baker Hughes deployed for a recent major discovery in the offshore Egyptian water a Rotary Steerable System with a more advanced bottomhole assembly, the latest Formation Evaluation technology, and completion systems technology, with flawless execution.

Baker Hughes Kymera & Talon Drill Bits –using the latest technology– were run to drill the longest 8 ½ " hole in the OBA-D Area: The New Stay Cool TD 407X sets a new field record, achieving one of the fastest and longest directional run ever in Sitra 8 field.

"In addition to the various production optimization products currently deployed in the market, I want to point out our micro cure remediation treatment product which is being used to remove previous wellbore damage, while significantly improving the production rate in various fields in Egypt," he added.

Challenges Faced

When asked about the major challenges the company is facing in Egypt, Jammal explained that the competitive market landscape in Egypt gravitates around the low price products and services, and this model creates challenges in introducing new technology, and in turn leads to missed opportunity by end users to reap the great value these best in class technology can bring to their assets. In addition, some of the most significant challenges nowadays are the lack of funds with some customers, as well as the high percentage of EGP settlement in exchange of USD, where devaluation of the currency in the last couple of years have negatively impacted all investors.

"The market outlook for 2016 still looks increasingly challenging with a potential of further drop in activity."

"This situation has hindered us from major investments in the country."

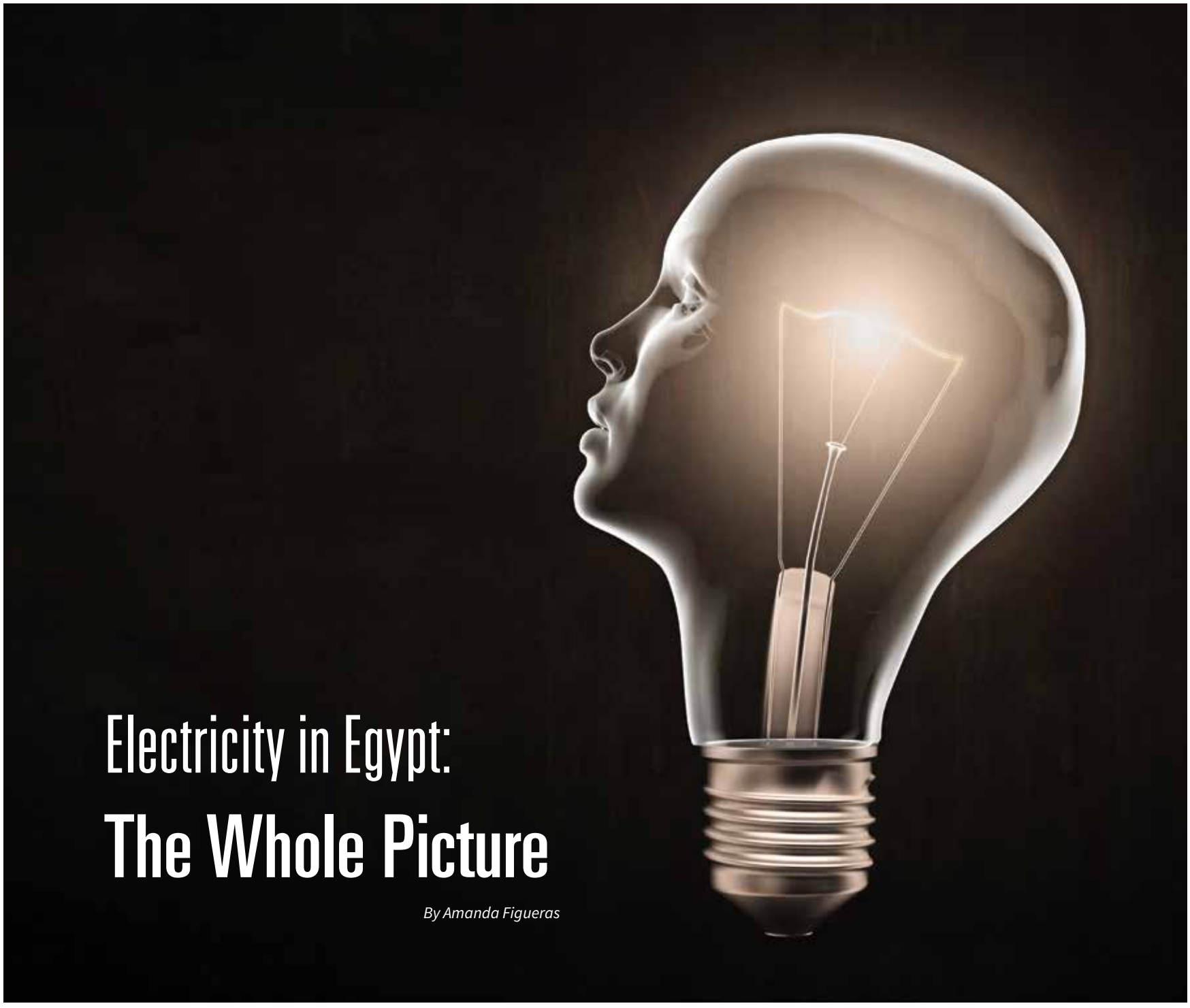
In discussions of the foreign currency shortage the country is currently facing, Jammal addressed the issue saying "the lack of foreign currency coupled with the deterioration of the Egyptian pound has made it difficult, and created a lot of pressure on our operations in Egypt," he continues "this situation has hindered us from major investments in the country. Having said that, we have seen some improvements recently, and we are hopeful this trend will continue to stabilize and get things back on track."

Egypt Oil & Gas asked about the recent reported 39% drop in the company's worldwide revenues in Q3-2015. "Baker Hughes business, similar to other services providers, is heavily dependent on the plans of the Oil & Gas producers, and the global decline in oil prices has made a significant impact on their activities. We continue to adjust to the difficult market conditions and have taken decisive actions to cut spending companywide and focus on strengthening our revenue and profitability so we will be well positioned for growth when the market stabilizes. We also remain focused on developing innovative products and customer service." Jammal confirmed.

When asked about the efforts of some operators to renegotiate contracts, Jammal answered "we understand the need for the producers to manage their cost so they can continue looking for, and further develop their reserves," adding "during a down turn, the fastest reaction from operators is reduction in cost, where they mainly focus on the discounts of the services they are provided. We, at Baker Hughes are also looking very thoroughly into every element of our business to manage and optimize cost, and hence, cope with market conditions. We are partners with our producers and we are exerting all efforts to help them carry on their activities. We are looking to optimize operations for the lowest cost, and furthermore using high-end technologies which in turn maximizes value for customers."

Egypt Oil & Gas further addressed the subject by noting Minister of Petroleum, Eng. Tarek El Molla's notion to renegotiate contracts with E&P companies, which could further the pressure on service companies, or dramatically improve the current environment. "We believe that reviewing deals with E&P companies will be positive for all relevant stakeholders. More favorable terms for operators could entice them to further invest in Egypt, in turn increasing activities, and opening new opportunities for Baker Hughes and other service companies. I believe we are already witnessing some positive impact as a result of the contract renegotiation since several IOC's have committed to substantial investment in the Egyptian market," explained Jammal.

In conclusion, Jammal addressed the prospects for the Egyptian petroleum industry in 2016 saying "the supply-demand fundamentals are called into question. The market outlook for 2016 still looks increasingly challenging with a potential of further drop in activity, the shortage in cash flow is one of the main catalysts that is driving operators to curtail their CAPEX on major projects. My take is that the major operators will have a conservative outlook on spending for next year even if we see a gradual improvement in oil & gas prices. Egypt on the other hand is moving fast in the direction of insuring payback for investors fueling the appetite for more investment in the oil & gas sector."



Electricity in Egypt: The Whole Picture

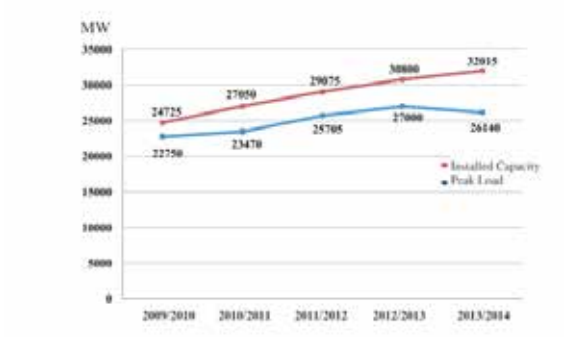
By Amanda Figueras

One of the first sentences that a non Arabic speaker learns upon moving to Egypt is probably 'Mafish kaharaba', or "there is no electricity". In summer, especially, and quite notably since the Revolution, Egypt has been suffering from an acute electricity crisis.

Natural gas supply shortage, aging infrastructure, inadequate generation, and transmission capacity are making it very difficult for the country to cope with the sharply rising demand. In addition, recent political and social unrest have slowed the government's plans to expand power generation capacity by 30 GW by 2020.

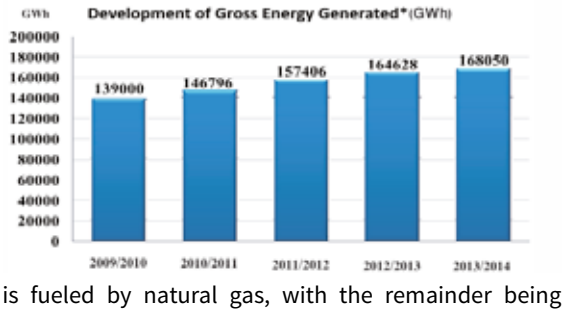
Egypt's generating capacity currently shows a negative reserve margin. As of May 2015, Egypt's generating capacity was 31.45 GW, which is slightly higher than the expected peak demand of 30 GW for the year, according to the Middle East Economic Survey (MEES). To put this in context, peak load grows annually by 3.5%, while the installed capacity grew by an average of 6.7% per year during the period extending from 2007/2010 to 2013/2014, according to the Egyptian Electricity Holding Company (EEHC).

Evolution of the peak load & installed capacity (MW):

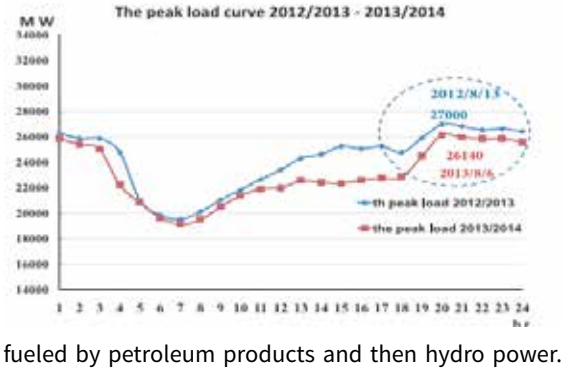


By type, the installed capacity in 2013/2014 was 43% steam, 35% combined, 11% gas, 9% hydro and 2% renewable. The renewable sector marks the largest gap between the actual generating potential in natural resources and the installed generating capacity; however, as the EEHC explained in its annual report, the government cannot make full use of the total installed capacity due to considerably aging network. Moreover, it is not possible to fully make use of the available capacity due to the condition of power generating units, the type and specifications of fuel supplied to the power plants, as well as the negative impact on some gas and combined-cycle units caused by high temperatures. In addition, the hydro-power capacity depends on dam water discharge for irrigation specified by the Ministry of Water Resources and Irrigation.

Given all these factors, the annual growth rate of generated energy was 4.9% during the period extending from 2009/2010 to 2013/2014. According to a report published by the German Marshal Fund, the overall energy demand in Egypt rose by 5.6%, while gas demand in particular grew by 8.7%. The main culprit for the significant hike in gas demand is electricity generation, as most of Egypt's electricity



is fueled by natural gas, with the remainder being



fueled by petroleum products and then hydro power. Considerable dependence on gas has not decreased in recent years. The report, however, states that by 2020 gas is to account for only 35% of the country's total energy production.

Natural gas, the dilemma of the source

According to the 2013/2014 ministerial data, natural gas accounts for 77.8% of total fuel consumed in Egypt, and by extension it represents 75.2% of the fuel consumed by power plants connected to the gas network; while the remaining percentage is covered by gasoil and Diesel.

Despite significant natural gas reserves, and recent discoveries of new deposits such as Zohr, Egyptian production has not been fast or efficient enough to keep up with growing demand. In the fiscal year 2013/2014, Egypt produced 2.034 tcf in comparison with 2.27 tcf in 2012/2013. According to the 2014/2015 Egyptian Natural Gas Holding Company's(EGAS) annual report, Egypt's production was declining monthly by 100 mcf; In addition, all compensatory wells connected to the production line since 2014 provides no more than 700 mcf annually. The main reason why compensatory wells were not connected to the production cycle was a lack of new petroleum agreements between the period of 2011 and 2013. The report also stated that a total loss of Egypt's gas production is estimated at 500 mcf per year.

According to EGAS' expectations, domestic production of gas is to increase by 2017 when a connection between the wells of the Alexandria project and the Zohr field in the Mediterranean Sea is established. Regardless of this fact, local production is insufficient to meet electricity demand by households, cars and the industrial sector. Since March 2015, EGAS was forced to start importing LNG.

According to the Petroleum Ministry, the country is now directing 80% of its production of natural gas to electricity generation. The limitation of 20% of gas supplies for energy intensive factories is causing a severe strain. On top of that, the industrial sector's annual gas quota was cut short by a further 938 mcf to reach 519.8mcf per year; out of which the amount of 266mcf has been earmarked for fertilizers, 99 mcf for cement sector, 60 mcf for steel factories, and the remaining 94.9 mcf goes to the Methanex factory located in Damietta. These quantities are far from needed supplies for the industry to operate at its capacity, or at least without losses.

Meanwhile, a study by the Egyptian Center for Economic Studies (ECES) predicts that, due to the recent gas discovery by Italian Eni, Egypt will be able to double its natural gas production by 2018. Egypt is expected to add an average of 2.8 bcf/d of natural gas to its production levels. Over such a boom, Egypt will be able to significantly reduce its expected daily deficit of 3 bcf of natural gas in 2018.

Natural gas in Egypt is used for electrical generation, feedstock for factories, processing of petroleum products, transportation, and for powering residential and commercial venues. In an attempt to meet these demands, the government has so far relied on two short-term solutions; diverting natural gas from energy-intensive factories to power plants, and importing natural gas.

Although in November 2015 President Abdel Fatah Al Sisi announced that the supply shortages faced by energy intensive factories would cease by the end of the month, in December EGAS notified factories that their gas supply would be reduced 15% of the contracted quantity due to low pressure of gas in the national grid. This decision projects significant losses for the affected companies due to the stalled production.

In the meantime, the import of natural gas is expensive. According to an official at the Egyptian General Petroleum Company (EGPC), the cost of the LNG imported in 2015 and 2016 is estimated at $3.55b. This represents a huge cost for a country that has been facing challenges over its lacking foreign currency reserves in the past five years.

Not producing enough

The current cost of domestic gas production is about $3.1/MMBtu on average. In an article published by Platts, Mohammed El Sobki, the Executive Chairman of Egypt's New and Renewable Energy Authority (NREA) estimated that the production costs would rise over the next four years, reaching $9/MMBtu.

"Egypt is not avoiding any source of energy," El Sobki said in response to a question with regards to whether or not the country would seek to develop potential shale gas resources. As he explained that unlike gas imports, wind and solar power projects, costs of which have fallen significantly in recent years, were currently at a competitive price in relation to the capital and operating costs, which both are expected to decrease further.

Low efficiency, high intensity, and costly subsidies

Another obstacle is Egypt's lack of energy conservation culture and its problems with energy efficiency. The country's energy intensity is 26,000BTU per $1 of GDP, which is four to five times the intensity of most European countries. High energy intensity indicates a high price or cost for converting energy into GDP.

Subsidies are another issue in the energy matrix. The combination of increasing demand, decreasing production and high subsidies for fuel have put a strain on the Egyptian energy sector and led to an enormous public deficit. As of June 2014, Egypt has been indebted $7.5b to foreign oil and gas companies alone, according to the US Department of Energy. In 2013, the Egyptian government spent about $15.17b on fuel subsidies, which equals 7% of the GDP, according to a report by the Global Institute of Sustainable Development.

In order to meet the energy demand and prevent an Egyptian energy crisis, the Gulf countries have been providing financial aid to Egypt. However, this kind of aid is expected to decrease as falling oil prices have inflicted on the Gulf states.

Energy officials cited by Reuters said that a lack of reforms and the wasteful fuel subsidy system were keeping private investors, who could finance modernization and boost gas output, away.

No one wants to increase electrical generation capacity if the energy is ultimately sold for less than it costs to produce, and the artificially low prices give little incentives for Egyptians to curb their electricity consumption,

The price of electricity in Egypt ranks amongst the lowest in the world. The pricing structure varies according to the type of consumption (i.e. residential, commercial, industrial) and the amount consumed. The only minor incentive is that tariffs charged are based on a brackets system, as consumption increases, so do the tariffs. The lowest tariff of 5 piasters per KWh for residential consumption accounting for up to 50 KWh/month, has not changed since 1993. The government has been trying to cut costs for subsidies since 2007. First in July 2014, the electricity prices increased as a part of a five-year plan, which aims at generating profits from electricity, Al Arabia reported.

Egyptians pay the equivalent of between $0.1 to $0.7per KWh electricity in their homes. By contrast, U.S. households pay between $0.8 and $0.37, according to the U.S. Energy Information Administration data.

Investment needed: at least $5b

In the Egypt Economic Development Conference in Sharm el-Sheikh in March 2015, the electricity sector was one of the biggest beneficiaries in terms of investments. Memorandums of Understanding (MOU), or initial agreements, were reached with companies such as Saudi's ACWA Power, Dana Gas, Eni, Siemens, British Petroleum, and China State Grid. The concluded deals involve energy projects to build power plants fired by coal, natural gas and renewables.

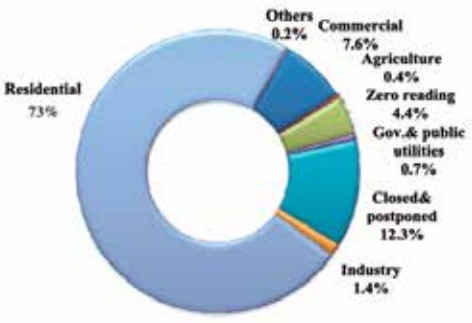
During his conference remarks, President Al Sisi said that 13 GW of power were expected to come online in the near future, helping to close an energy gap that had led to frequent electricity cuts and hampered industrial production, Mada Masr reported.

At least $5b of investments is required for Egypt's chronically under-invested and neglected central power grid – a total of 43,634 km of transmission lines and cables, a government official told Reuters.

Egypt is rolling out to have one of the most ambitious renewable energy programs in the Middle East and North African region, as it is seeking to meet surging domestic energy demand, while curbing its reliance on fossil fuel imports, an official said to Platts.

Number of Customers According to Purpose of Usage (Medium and low Voltage) 2013/2014

Purpose of Usage	No. of Customers (Thousand Customer)
Industry	436
Agriculture	109
Government & Public Utilities	209
Residential	22355
Commercial Shops	2313
Closed & postponed	3777
Zero reading	1338
Others	63
Total	30600

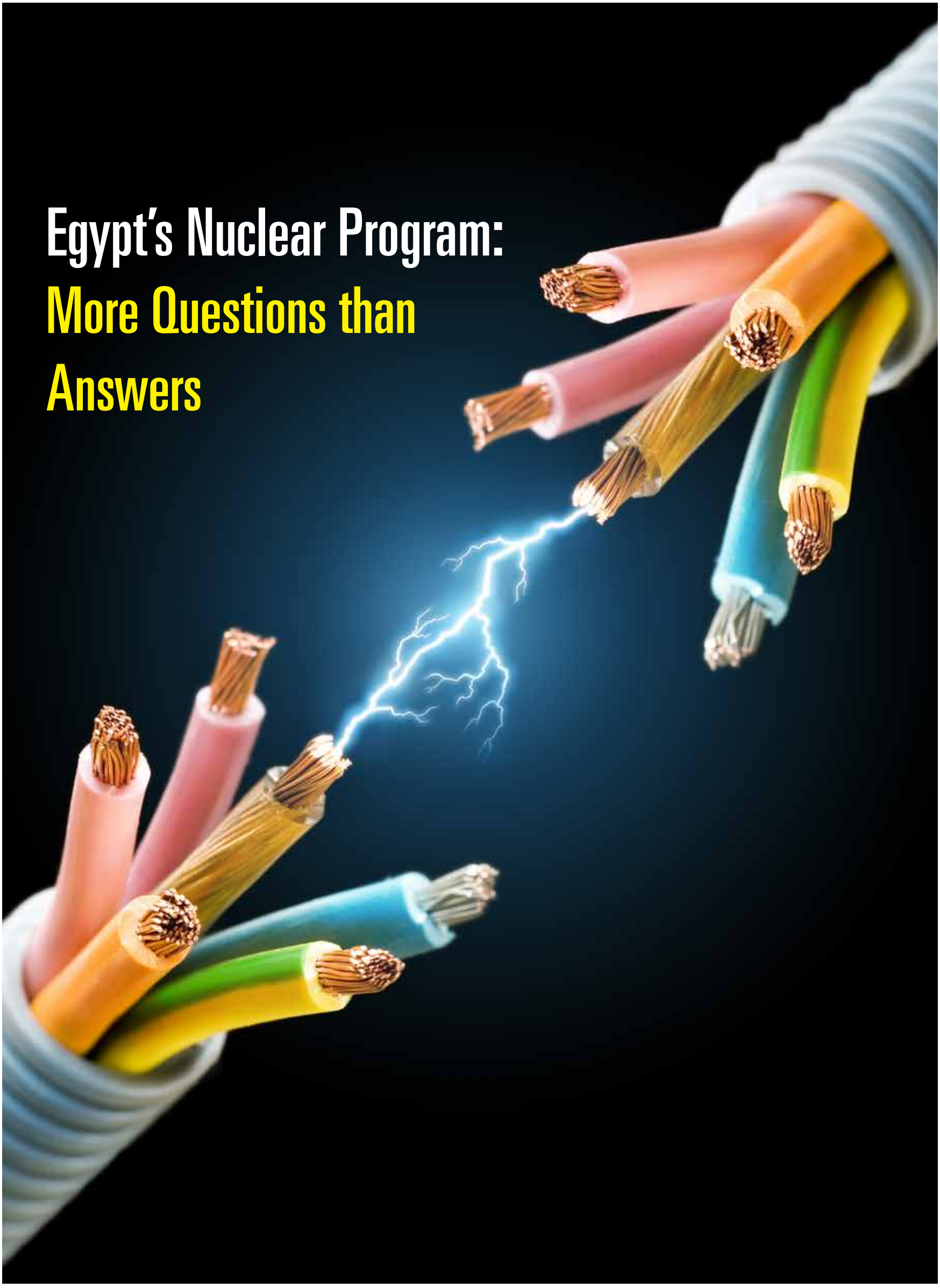


As announced by President Al Sisi, Egypt would seek to establish 4,300 MW wind and solar power generators during the 2015-2017 period.

Egypt's target to create a specific energy mix by 2022 consisting of 13,500 MW of power generation capacity from renewable sources and 6,000 MW of nuclear power capacity. This is in addition to thermal electricity generation from gas and coal with the latter contributing with up to 20 MW to the intended capacity boost. The overall contribution of fossil fuels to the nation's power supply would decline to about 40% in 2022, down from 94% in 2014, ElSobki said.

Egypt is facing a challenge. A plan is already on the table and only time will say if enough efforts are directed to finding an efficient and comprehensive solution.

Egypt's Nuclear Program: More Questions than Answers



On November 19th, President Abdul Fattah Al-Sisi announced that Egypt's "long dream" of nuclear energy had come true. The Egyptian nuclear program, initiated during the Nasser presidency in 1955, is finally taking a step towards electricity production after sitting dormant for most of the last 60 years.

Today's reasons for reviving the Dabaa project are similar to those of Nasser's era for starting it in 1956. At the time, Egypt needed much greater electricity generation to support the government's industrialization plans, although the Aswan Dam proved a much more successful solution. The Dabaa announcement also comes as Sisi, like Nasser before him, seeks to build a closer relationship with Russia. The Dabaa plant is the largest Russian-Egyptian project since the Aswan High Dam – a fact both sides celebrated, calling the deal a "new chapter in the history of our bilateral relations."

Few technical or financial details of the project have been released. In announcing the agreement, the government stated that the Dabaa plant will be built by Russia's Rosatom and will consist of four "generation 3+ power-generation units," each with an output capacity of 1200MW. The plant is expected to be finished by 2022 and to be plugged into the grid by 2024, according to Prime Minister, Sherif Ismail. Russia is reported to be financing 85% of the 35-year loan for the project, which will be repaid with revenues from "the actual production of electricity," according to Sisi. The cost of building the facility and the shares of electricity produced from it have not be released, nor have plans for how Dabaa energy will be brought into the existing system, over what time frame and what role nuclear energy will play in Egypt's larger energy mix.

Dabaa is one of the most notable national projects that the government has announced over the past year and a half, along with the expansion of the Suez Canal and plans for Egypt's new administrative capital. Despite the fanfare, some remain skeptical of projects such as Dabaa, questioning its substantial costs, its potential dangers and its business-sense. Abroad, media outlets and experts have questioned the value of the project, offering that Dabaa may fit into the 'white elephant' category – a politically-motivated project that makes limited economic sense.

The expanded Suez Canal, which has not seen a dramatic rise in revenue to meet its newly increased capacity, seems to confirm skeptics' suspicions. But the Dabaa plant fits a more pressing need for Egypt than the Canal, as the country faces serious energy shortages, which the government is rapidly trying to alleviate. The key question becomes how well will the Dabaa nuclear plant meet Egypt's energy needs by the time production starts in 2024?

This is obviously a difficult question to answer, as the plant will not produce energy for nearly a decade to come and because Egypt, like most countries, is hesitant to share the details of its nuclear program. However, we can look at projections and trends in the Egyptian energy industry to gain a clearer picture of Dabaa's implications.

A Solution to Egypt's Problems?

The main problem Egypt has faced in electricity over the past five years has been the declining domestic energy production combined with dramatically increasing consumption. As a result, Egypt has been forced to import more electricity and to ration the resources it has. Over the past year, the government has chosen to cut energy in the industrial sector in favor of reducing shortages for the general population – a decision with serious economic repercussions. Egypt's industrial sector, most notably steel, cement and other commodities, has been held back as a result. Ezz Steel, Egypt's largest steel maker, has reported severe losses in 2015, "principally due to constant disruption of utilities and lack of natural gas," a company statement said. The head of Egypt's cement producers association said the industry had lost 40% of its production capacity due to energy cuts.

The government has made the expansion of electricity production a primary goal – increasing gas and petroleum product imports, promoting new domestic exploration and production and pushing for greater investment in alternative energy. To policymakers, the Dabaa plant represents part of the solution to Egypt's energy problems – helping to relieve economic shortfalls and eventually contributing to Egypt becoming a net exporter of energy.

In the announcement of the agreement in late November, the government stated that the four 'state of the art' nuclear generation units Egypt is buying from Rosatom will have a capacity of 1200MW each for a total of 4800MW. Sisi stressed that "the country's balance sheet will not bear the cost of this loan, it will be covered by the production of electricity from the plant."

Determining how much of an impact Dabaa will make requires answers or projections for a number of questions. What are Dabaa's projected costs and revenues and how will these be shared with Rosatom? What will Egypt's energy needs and abilities be by the time Dabaa is online? What will be the state of Egypt's overwhelmed electricity transmission system in 2024 and how will Dabaa fit into it? Given other government plans and goals, Dabaa's ultimate economic value seems debatable.

Demand for electricity in Egypt has grown rapidly over the last decade – a result of a fast-growing population. At its current growth rate, Egypt will be home to 96 million people by 2020 and around 102 million by 2024. The Egyptian Electric Utility and Consumer Protection Regulatory Agency (ERA) has estimated that electricity demand will nearly double by 2027 to 57,000 MW. Egypt's electricity capacity was around 31,500 MW in May 2015, a figure that will increase to around 35,000 MW by the end of 2016, according to Electricity Minister, Mohamed Shaker. Earlier this year, the Egyptian government announced its goal to double its generation capacity to 60,000 MW by 2020 – an ambitious goal for any state, much less one with financial challenges. Further complicating these targets is the fact that Egypt's electricity infrastructure is in serious need of repair and investment – a problem for which the Egyptian government has sought international assistance. Egypt has been making progress in expanding its generation capacity, increasing capacity by nearly 7,000 MW in 2015. However, the expansion has been expensive, coming largely through the use of imported natural gas, oil and coal – a trend likely to continue in the immediate future, but which will likely change in the years to come.

In February, during his time as Petroleum Minister, Prime Minister Sherif Ismail said that by 2020, "we are targeting to stop importing gas with the completion of developing gas field projects." Such a plan requires a substantial increase in domestic production, which has been hampered in recent years. However, recent discoveries hold promise that the goal can be met. Especially after the discovery of the Zohr Field, which accounts for around 40% of Egyptian gas reserves, the government has indicated that massive new supplies will bring greater balance to Egypt's energy mix over the next decade – eliminating shortages, boosting economic production, and eventually allowing Egypt to return to net exporter status. Furthermore, the Egyptian government has made strides in promoting alternative energy – aiming for 20% of Egyptian energy to come from alternatives by 2020. Thus far, the feed-in tariff program seems to be attracting international investment in wind and solar farms. The prospects for increased domestic production of conventional and renewable energy seem bright, raising questions over the need for nuclear energy.

Much of the numbers above represent best-case-scenarios, according to which all of the relevant parties will be able to achieve their projections within their announced time frames. In Egypt, best case scenario's targets are rarely easily achieved, complicated by a number of things. Now one month since the inking of the Dabaa deal, only time will tell how the plant's construction will go and how its energy will be absorbed into Egypt's existing electricity system. However, the figures above raise the question that, if all of these targets have been met by the time the plant comes online in 2024 – meaning that electricity production has doubled, Egypt's domestic energy reserves are more than sufficient, alternative energy is playing a major role, and so on – will Dabaa be necessary and important for Egypt's energy needs?

Dabaa as a National Project

Egypt's move has allowed it to join other Middle East states entering the nuclear club. Most recently Jordan, a country with rapidly growing energy demand and almost no domestic reserves of its own, signed a $10b deal with Rosatom to develop the plans for its nuclear power plants, which have been delayed over insufficient water supplies and upset Jordanians. Saudi Arabia and the UAE are also building nuclear plants – aiming to free up domestically used resources for sale abroad. Analysts disagree on the value of these plants for the Gulf States, as low prices and high domestic reserves may make gas-fired production more economical. By this argument, if prices remain low and massive new Egyptian gas reserves come online, Dabaa may make less sense.

All of this said, details for the Dabaa project are very scarce, making it hard to reach conclusions. Experts approached to discuss the topic cited insufficient information available to really understand Dabaa's long-term implications for the Egyptian energy industry. We can say that based on the information available, if things go according to plan, Dabaa will play some role in meeting Egypt's energy needs by the time of production a decade from now. However, it is fair to question the larger logic of the project, based on other information available.

According to the figures above, if all goes as planned, Dabaa may have a maximum ability to contribute 8% of Egypt's energy capacity in 2024, but only if the plant is brought to full capacity immediately, which seems unlikely. Further, the government hopes that renewables will constitute at least 20% of Egyptian needs by that time and that newfound reserves will be able to meet domestic demand, which hopefully will be more efficient as subsidy cuts are instituted. Egypt currently faces extraordinarily high energy intensity figures – meaning that the amount Egypt spends on energy today is very inefficiently contributing to GDP. The high costs of the project are unlikely to bring these figures down in the way conventional and alternatives might.

Nuclear energy has fallen out of favor in much of the world due to environmental wariness, regulatory burdens, prohibitive costs, and political challenges at home and abroad. Critics of Dabaa ask why not devote greater resources and energy to expanding the conventional and alternative production methods, which are already online and avoid the headaches that come with building a nuclear plant?

The answer is probably not surprising. The announcements and coverage surrounding the agreement have touted the project as a national achievement and as representative of Egypt's return as a regional leader: "For a long time, Egypt has dreamt of having a peaceful nuclear program for the production of electricity," Sisi said. Sentiments from Russia have been the same: "The plant will make Egypt the regional leader in the field of nuclear technologies and the only country in the region that will have a generation 3+ plant," said Rosatom Head, Sergey Kiriyenko. The international prestige that comes with joining the nuclear club and a chance to present another high-profile success domestically, combined with Egypt's mad-rush to expand electricity production, seem to have pushed a project with questionable economic sense to one of national importance. For now, Dabaa's implication for the Egyptian energy industry remains very unclear, while the politics and celebration of the project do not.

Coal for Energy:
A Future or a Roadblock?

By Eduard Cousin

During the climate talks in Paris in early December, countries agreed to limit their carbon dioxide emissions. Several European countries have ambitious plans to close their coal-fired power plants. Coal, a large contributor to carbon dioxide emissions, seems to be on the retreat. However, Egypt is moving in a different direction.

In April 2014 Egyptian laws were adjusted to allow and regulate the use of coal in factories - particularly in the cement and iron industry - and power plants.

Cement companies as Lafarge and Italicementi have already started using coal, and power plants are about to follow suit. Emirati company Al Nowais Investments signed a deal in September 2014 with the Egyptian Electricity Holding Company to build a coal-fired power plant with a generation capacity of 2,640 MW in South Sinai's Oyoun Moussa area. A second agreement followed in November 2014. A consortium of Orascom Constructions and Emirati International Petroleum Investment Company was contracted to build a 3,000 MW coal-fired power plant near Hamrawein Port on the Red Sea coast.

During the Egypt Economic Development Conference in March 2015, further steps towards coal were taken. A memorandum of understanding was signed with Saudi company ACWA Power to develop a 2,000 MW coal-fired power plant, at an investment cost of $7b, and with possibilities to extend to 4,000 MW. Another memorandum was signed with Tharwat Investments, to build a 6,000 MW coal-fired power plant at a cost of $11bn.

The path towards coal was confirmed in May 2015, when an official quoted by online news outlet Mada Masr said Egypt plans to rely on coal for 25%-30% of its electricity in 2030. The capacity that needs to be installed for this would amount to at least 15,000 MW, taken into account government plans to double total generation capacity to about 60,000 MW by 2020.

Energy deficit

Reasons for Egypt to turn to coal are not difficult the find. In the post-revolution years the country has struggled with large energy deficits, leading especially in the hot summer months, when energy demands rise due to AC use, to frequent power cuts. The situation was at a low in summer 2014, when five of more blackouts of an hour per day were not uncommon. A shortage of gas to fuel power plants, exaggerated by old plants with a low efficiency, was the main cause of the deficit. In summer 2015, the power cuts occurred much less, but that was due to the government cutting gas supplies to factories.

A factor that compounded the problem was Egypt's population, hence its energy demand, has increased sharply over the past five years, and is projected to rise even further. According to estimates the population of now 90 million will hit 117 million in 2030; therefore, to provide for its citizens and keep its factories running, Egypt needs a significant amount of energy, urgently.

Coal can provide this energy, and its great benefit over gas and other resources is that it is cheap. 1 mmbtu produced by coal costs $2.06; for natural gas that stands on around $2.24 in early December. However, the gap has been rapidly declining over the past year.

Also, with the newest discovery of a "supergiant" gas field in the Egypt's Mediterranean waters buy Italian company Eni, it remains a question if coal is actually the fuel of the future for Egypt. Nevertheless, the government plans to import 30m tons of coal yearly to fuel its planned power plants.

Environment

The main concern for Egypt's coal plans is not its availability of cost; it is the environment.

From the moment the government changed regulations to favor coal use, environmental groups, and then Environment Minster Leila Iskander, have opposed coal.

The Egyptian Initiative for Personal Rights released a statement in May 2015 stressing the environment and health complications of using coal. The NGO mentioned a report by the Ministry of Environment estimating the additional health costs of using coal in cement factories $3.9b annually, and for using coal for electricity $5.9b annually, hence possibly exceeding the price of natural gas as an electricity source.

Sarah Rifaat, from the campaign Egyptians Against Coal (EAC), lambasts the lack of transparent communication of the government concerning its plans for coal. "There are contradictory statements on how much coal Egypt wants to use, there is no vision," she tells Egypt Oil & Gas.

Coal has a reputation of a dirty fuel, both for its emission of carbon dioxide, responsible for climate change, and other polluters as nitrogen, sulfur and mercury. A gas-fired plant is much cleaner, emitting "half as much carbon dioxide, less than a third of the nitrogen oxides, one percent of the sulfur oxides, and much lower levels of mercury than plants that burn coal," according to National Geographic figures.

Following the criticism, Egypt has adopted regulations for coal use to protect the environment. However, Rifaat is not convinced. "There are regulations now, but the problem is implementation." She mentions that cement factory Lafarge, that recently started using coal in its factories, has already violated these regulations.

Cement factory Lafarge, using coal in its factories in Egypt, has been fined EGP 10,000 for violating regulations. A report from the Ministry of Environment stated the Larfarge had dumped "234,000 tones of dangerous dust".

A company official told Daily News Egypt on the issue: "We have settled the previous environmental violations against the factory, and we are currently coordinating with the Egyptian Environmental Affairs Agency to adjust to regulations within two months."

However, according to Rifaat, "many companies are not following the stricter regulations, […] as big companies do not care about the health impacts."

EAC aims to mobilize local communities to oppose the construction of coal-fired power plants, because "once connected to the energy grid, there is no way back," says Rifaat.

The way forward

Despite these concerns, the government seems determined to move forward with coal. Minister of Environment Khaled Fahmy, speaking on the Egypt Coal conference in May, said turning to coal is an "inevitable decision," while stressing the strict environment regulations in place, or in the words of former Petroleum Minister, Osama Kamal: "We don't have the luxury of choice."

These statements echo the main argument for coal: Egypt simply cannot afford to not use it, if it wants to pursue its path towards industrial development and keep up with increasing energy demands of its growing population.

Egypt is not alone in this; other emerging economies such as China and India have also turned to coal as a cheap energy resource. At the Paris climate summit Indian Minister of Coal and Energy, Piyush Goyal, put it clearly: "We are not ashamed of using coal. The US and the West have developed themselves for 150 years based on cheap energy from coal."

The Legal Reality of the ICC Ruling Against Egypt

By Essam Taha, Attorney at Law-Petroleum Agreements Expert

On December 3rd 2015, the International Chamber of Commerce (ICC) announced its ruling on the arbitration claim submitted by Israel Electric Company (IEC) against the Egyptian General Petroleum Corporation (EGPC), the Egyptian Natural Gas Holding Company (EGAS), and East Mediterranean Gas Company (EMG). The ruling states that EGPC and EGAS are to pay the sum of $1.76b to IEC as compensation, in addition to paying to EMG the sum of $324m as compensation, including a substantial portion of EMG's legal fees and arbitration costs.

EGPC and EGAS, acting as one party, have signed a gas sales agreement with EMG on June 13th 2005. The agreement includes that EGPC and EGAS shall sell to EMG for the purposes of export to Israel an annual quantity of 7 bcm for 15 years. The agreement stated that in case of any shortfall to such quantity, EGPC and EGAS shall pay a sum of $50,000 per day during the period of shortfall, in addition to bearing the whole costs incurred by EMG in such project up to a sum of $ 12m.

A second agreement was sign on June 30th of the same year between EGPC and EGAS as the first party (Seller), EMG as the second party (Purchaser) and IEC as the third party (Importer). The purpose of the agreement was to enable the exportation of gas from Egypt to Israel, passing through EMG's pipelines. By this agreement EGPC and EGAS guarantee the continuous and uninterrupted supply of the gas sold to EMG to be exported to Israel.

On the same day, June 30th 2005, the former Egyptian Minister of Petroleum and Mineral Resources signed a Memorandum of Understanding (MoU) with the Israeli Minister of the Infrastructure on behalf of the Egyptian Government.

The MoU states that: The Government of Egypt guarantees the continuous and uninterrupted supply of the Natural Gas contracted and/or to be contracted between EMG and IEC for an initial 15 years and for a yearly quantity up to 7 bcm; each government, according to its laws and regulations, shall determine the safety and security measures that govern the construction and operation of the part of the pipeline from El-Arish to Ashkelon under its jurisdiction; and the Egyptian Government designates EGPC and EGAS, as representatives of the Egyptian Ministry of Petroleum, in signing the tripartite agreement with EMG and IEC shall apply to any other entity importing gas from Egypt into Israel and/or consuming gas from Egypt in Israel.

In light of the award, and taking into consideration the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards, which Egypt accessioned to in 1959, some questions might be raised on such subject.

1. If the ICC is not the arbitration institution, agreed upon between the parties in said agreements, can Egypt reject the ruling?

Based on the ICC Rules of 2012, the respondent (Egypt) should submit within 30 days from receipt of the arbitration request an answer. Such answer must include any observation or proposals as to the place of the arbitration, the applicable rules of law, and also submit any relevant agreement and, in particular, arbitration agreement(s). If there were no observations or proposals, the arbitration shall proceed.

Based on the Egyptian Arbitration Law, if either party to a dispute knows of any unmet requirements or violations, yet proceeds with the arbitration without objecting within the period agreed upon, or without undue delay in the absence of such agreement, by law the party is considered to have waived their right to object.

Accordingly, in the event the respondent in the arbitration does not submit an objection from the beginning of the arbitration procedures, by law they cannot reject the ruling based on such cause.

2. Is the ICC ruling final and binding?

According to ICC rules, every ruling shall be binding to the parties, and by submitting the dispute to the ICC for arbitration both parties agree to carry out the ruling without delay.

Based on the Egyptian Arbitration Law, the only means to challenge the arbitration ruling is by annulment, which can occur if there is no arbitration agreement, if the agreement itself was void, or if its duration had elapsed, or either party to the arbitration agreement was, at the time of the conclusion of the arbitration agreement fully or partially incapacitated according to the law governing its legal capacity, or if either party was unable to present its case as a result of not being given proper notice of the appointment of an arbitrator or of the arbitral proceedings, or for any other reason beyond its control.

Other reasons include, the arbitral award failure to apply the law -agreed upon by the parties- to govern the subject matter in dispute, the composition of the arbitral tribunal or the appointment of the arbitrators was in conflict with the law or the parties' agreement, the arbitral award dealt with matters not falling within the scope of the arbitration agreement or exceeding the limit of the agreement, or the arbitral award itself or the arbitration procedures affecting the award contain a legal violation that causes nullity.

Under such Law, the request to annul the arbitral ruling must be brought before the court within 90 days of ruling.

The New York Convention, however, allows for the refusal to recognize and enforce of the ruling, at the request of the party against whom it is invoked, only if that party furnishes to the competent authority where the recognition and enforcement is sought, proof that:

- The parties to the arbitration agreement, under the law applicable to them, are under some incapacity, or such agreement is not valid under the law to which the parties have subjected it or, failing any indication thereon, under the law of the country where the award was made.
- The party against whom the award is invoked was not given proper notice of the appointment of the arbitrator or of the arbitration proceedings, or was otherwise unable to present its case.
- The award deals with a difference not contemplated by or not falling within the terms of the submission to arbitration, or it contains decisions on matters beyond the scope of the submission to arbitration.
- The composition of the arbitral authority or the arbitral procedures were not in accordance with the arbitration agreement, or with the law of the country where the arbitration took place.
- The award has not yet become binding on the parties, or has been set aside or suspended by a competent authority of the country in which, or under the law of which, that award was made.

What this means is that in light of the ICC Arbitration Rules, the Egyptian Arbitration Law, and New York Convention, the arbitration ruling against Egypt, may not be subject to any means of recourse, but may only be subject to annulment in case of the presence of one of the causes mentioned above.

3. To what extent the Egyptian Government is responsible under such ruling?

Based on the signed MoU the former Egyptian Minister of Petroleum acknowledged that the Egyptian Government, represented in EGPC and EGAS as the first party (Seller) in the agreement, the same shall apply to any other entity importing gas from Egypt into Israel and/or consuming gas from Egypt in Israel. In addition, the Egyptian government guarantees the continuous and uninterrupted supply of natural gas contracted such as between EMG and IEC for the initial 15 years, as well as for any extensions.

Based on the signature of the Egyptian Minister of Petroleum on the MoU on behalf of the Egyptian Government and the guarantees of continuity and un-interruption of gas supply to EMG to be exported to Israel and designation of EGPC and EGAS as representatives of the Egyptian Government in signing the tripartite agreement; and

Based on the general rules of the Egyptian Civil Code, which govern the relation between the principal and his representative, the consequences of such tripartite agreement shall be referred to the Ministry of Petroleum as a party to the Egyptian Government and not to EGPC or EGAS.

Therefore, the Government of Egypt, represented by the Ministry of Petroleum, shall be responsible for the execution of the arbitral award and the payment of $ 1.76b as compensation for stopping the supply of the gas and violating its guarantees and obligations under such agreement and the MoU.

EGYPT OIL AND GAS

PEOPLE DEVELOPMENT

ROUNDTABLE

COMPETENCY AND DEVELOPMENT REQUIREMENTS FOR CAREER PROGRESSION

- Definitions of competency requirements for specific jobs.
- Competence and expertise assessments for individuals.
- Career path within organization.
- Retention of talented staff.

IOC/EGPC PARTNERSHIP

- Obligations within concession agreements.
- Defining roles of IOCs and government in people development within the JV environment.
- Barriers to personnel development.

DEVELOPMENT OF TECHNICAL AND NON-TECHNICAL STAFF

- Traditional focus is on professional level staff – G&G, Engineering etc.
- Field operations can also benefit from improved competence. How can that be achieved?
- Developing commercial and support staff such as contracting, agreements, finance, human resources and administration.

MAKING IN-COUNTRY TRAINING MORE EFFECTIVE

- The role of OGS.
- Support from international institutions.
- The role of academia in Egypt.

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EGYPT OIL&GAS NEWSPAPER

SOLAR POWER & POLICY:
Renewable Solutions for Egypt's Electricity Crisis

By Emad El-Din Aysha, PhD

It appears that the renewable energy industry in Egypt previously had been managed in a similar way as other sectors in the country, such as transportation or retail. Analogies with the taxi transportation system may help to draw a clearer image of the conditions for renewables.

Taxis in Cairo use two kinds of electric meters, the older green model with a racing horse that can be tampered with, and the new orange kind from Taiwan. The latter was pre-programed, tamper-proofed and it had to be registered with the central authorities controlling the warranty. This also meant that the repairs were the sole job of the warranty holder. The green ones were exempt from the registration and their warranty was not controlled. The transportation system was lagging behind due to a series of regulatory issues. Similarly, the renewables sector is currently facing difficulties, not of a technical or even an economic nature, but related to the regulatory environment.

An energy expert, who prefers to go unnamed, explains that to create an incentive structure for renewables will not be enough, if smart meters for measuring the consumption are not introduced. The Ministry of Electricity is supposed to issue and register the meters to be able to accurately measure how much power of the national grid was consumed from renewables. But the ministry has been so far been dragging its feet over this measure. This step, in turn, opens up legal issues as consumers may claim that the readings on their meters, which they purchased on the free market, do not match estimates done by the ministry.

In a similar fashion, businessmen in Egypt have filed cases at the constitutional court with regard to sales tax imposed on their enterprise showing that their companies were in fact exempted from this category of taxation. Many won those cases and were compensated, a process that saps money from state coffers.

The Ministry of Finance, the expert adds, had to approve loans for renewables projects, which had been occurring with usual bureaucratic delays. But that was in the past, and currently the situation has changed. In the present, the government has committed itself to generating 20% of the country's energy from renewables by 2020 and aspires to a loftier goal of energy self-sufficiency by 2022, following the Eni mega gas find.

If the aforementioned regulatory hurdles are removed, will these goals be attainable in principle, on the technological and economic levels? What measures have to be adopted at the policy level in order for such feasible solutions to be taken up and implemented on a national scale by government agencies, the public sector, businesses, and by the common man? What kind of renewable technologies are the most suitable for a country like Egypt? What kind of a mix of renewable, conventional and alternate sources of energy should Egypt shoot for? And what can we learn from comparisons and experience with renewables that other countries have had?

Solar Power: Jewel in the Crown

An energy and petroleum expert, Dr. Magdi Nasrallah, says that an ideal energy mix for Egypt consists of 40% from oil and gas, 20% coal, 20% nuclear, and 20% renewable energy (solar, wind, hydro, biomass, geothermal, etc). Solar power should be the main source of renewable energy, as wind power, while being a cheaper alternative, is not as reliable, and therefore less suitable on the national scale. Wind power is only beneficial at a certain wind speed that Egypt enjoys merely on a narrow strip along the Red Sea coast. Additionally, the ideal wind speed is between 5 to 8 meters per second, as stronger winds may burn turbines and damage blades.

Egypt is strategically located on the world's solar belt, says Dr. Ehab Abdel-Rahman, a physicist and the Vice Provost for Research at the American University in Cairo. He explains that in pursuing solar power in the country you also must decide what kind of solar power is the most suitable to be utilized on the national scale: Photovoltaic (PV) or Concentrated Solar Power (CSP)?

PV transforms light into electricity directly, whereas CSP focuses solar rays onto a heat-engine to generate electricity through turbines that utilize vaporized water. Great advances have certainly been achieved in recent years, says Nasrallah, specifically in the area of photovoltaic (PV) technology, upping the efficiency level of solar energy from 25% to 50%. PV technology is more reliable and generates more electricity; however, it is also technologically more sophisticated, therefore more costly as the solar cells are made out of rare materials like arsenic and selenide, Abdel-Rahman specifies. PV technology was developed in the North and so works better in cold weather. PV solar cells invariably wear out in a hot climate, as Egypt enjoys. On the other hand, CSP technology is much cheaper and low-tech, based on sand and metal. It relies on focused light reflected off mirrors, and mirrors are sturdier in a hot climate. But what is more important, CSPs can be manufactured locally, while factories that produce PV panels in Egypt still have to import the solar cells and other components from abroad, depriving the country of much needed hard currency. This is not to discount PV technology, Abdel-Rahman says, but it appears to be more of a long-term option.

The existing Feed-in-Tariff (FiT) system may help to fill the gap by introducing long-term fees for electricity generated by renewables. Dr. Mohamed Shaker, Minister of Electricity and Renewable Energy; Dr. Hafez A. El-Salmawy, Managing Director Egyptian Electricity Regulatory Authority; and Dr. Mohamed El Sobki, Executive Chairman of the New and Renewable Energy Authority developed the scheme to reward higher KW electricity producers in an effort to draw in large foreign investors with easy access to the PV, and thus free Egyptian investors from costly high-tech imports. Abdel-Rahman adds that solar power cannot function at the national level without paying attention to national policy considerations.

As Abdel-Rahman explains, the elementary problem with any kind of solar power is its intermittency, as solar radiation levels vary even during the daytime. To store the energy through batteries is too expensive and unreliable to be feasible; therefore, it is better to transmit electricity to the national grid immediately, under a precondition that this will be a smart grid capable of balancing intermittent flow of electricity from the solar power source.

Planning for Scale and Size

A renewables expert and environmental scientist, Dr. Mohamed Bayoumi of

the UN Development Program (UNDP), points out that while governments tackle large scale solar projects connected to national grids, non-profit organizations can also contribute by developing small scale, off-grid strategies.

The UNDP specializes in bringing in inexpensive, tried-and-tested technologies such as bio-energy from India, and affordable solar panels for homes and office buildings. In particular, biomass energy can sufficiently fuel households that are currently dependent on butane gas cylinders for cooking and heating water, Bayoumi added.

Small-scale energy projects are also more suitable for smaller, isolated populations, says solar power expert, Ahmed Zakaria. Stand-alone power plants (solar, wind-farms, biomass) are ideal for isolated villages and far-off desert settlements, where the population is too small to garner profits, given the expenses involved in supplying energy for a national grid. They serve as an alternative, a decentralized source of power, which rids the grid off additional pressure. Stand-alone plants have an advantage as they can also hedge against power failures at any renewable facility, leaving conventional power sources to maintain power levels if and when such eventualities occur. In addition, installing solar panels for Egyptian homes and buildings islimited by the size of rooftops. An average size of 120cm by 80cm is needed to generate 100W. But the houses in Egypt are not big enough to provide that, even in the countryside.

An added benefit of the small scale approach is that it creates new jobs and contributes to indigenizing technological knowledge, explains Bayoumi. If there are 1,000 to 3,000 homes with PV panels, a ready-made market for solar technicians, repair and maintenance services emerges, as the existing reality for the Egyptian satellite dish market shows.

Funding for solar power research is the ultimate priority, according to Adel-Rahman, so that nations in the South would then be able to develop their own PV technologies suitable for their climates and resources. In addition, he concludes, two more prerequisites are important in order to successfully implement solar power strategies: specialized training for technicians in the field and a guidelines for quality standards of solar cells imported to Egypt.

In line with this argument, Egyptian solar power and renewables firms raise similar complaints. They say that provincial universities often lack of qualified professors and relevant engineering curricula on solar energy. The companies are thus forced to take on an educational function themselves and train graduates from scratch. They also face logistical problems as they are invariably located in the countryside or desert, which multiplies their expenses for connections to the national grid over long distances. Nonetheless, the companies are optimistic as the number of small and medium-sized Egyptian firms has increased recently and the quality of their production can withstands foreign competition in the sector. True to form, they were also increasingly relying on CSP technology that has been already developed locally with successful applications in the manufacturing sector.

AUC physics professor Dr. Salah Arafa's experience lends credence to the small-scale approach towards promoting solar energy. Arafa was the first to introduce solar panels to the Egyptian countryside in the village of Basaysa (in the Al-Sharqiya governorate) as far back as 1974. His key contribution was that he demonstrated an indispensable need for the integration of technologies towards local needs and capacities. He showed that technologies needed to be developed side-by-side, and local needs and resources be gauged through an active, participatory dialogue with villagers. "Sustainable Development cannot be achieved without an active participation of all stakeholders," therefore energy projects have to be based on the grass-roots level. In his opinion, volunteer experts from among students and engineers need to tackle the problems of illiteracy and brain-drain from villages to cities. This necessarily feeds back into the implementation processes of renewable energy as people thus become more receptive to power conservation.

Similarly, a targeted training builds up a pool of technicians with relevant qualification to design and repair locally suitable technologies. As technological solutions developed in field projects tend to emerge gradually, Arafa explains, an integrated approach can help in constructing hybrid energy systems as well. One such technology is to use solar power also for de-salination and water purification purposes. The very first piece of solar technology that Arafa had invented for the village connected a solar panel to a 12V car battery to power a TV set in the evening. The Basaysa model has since gone global, pursued by international aid agencies and developing nations alike, earning him the Man of the Year for Environment and Development honor rewarded by the Society of Writers on Environment and Development in 2009.

Renewable also smooth the path toward offloading population growth into the Desert. Hence Arafa's contribution in the New Basaysa desert settlement in Sinai, developed through a combination of organic agriculture, bio-gas plants, and solar energy for households. The Basaysa model is now being taken up by non-governmental organizations like Ain El-Bee'ah and Gamiyat Al-Khashaba as well as by renewables companies like Onera Systems, Karm-Solar and EFREgreen. They are implementing the model in multiple locations in Egypt stretching from Cairo's slums to Al-Minya, Sinai, and the Red Sea coast.

Possible Rebounds for Renewables

Renewables energy strategy will need another boost in order to take off in Egypt – a removal of energy subsidies. By increasing the price of conventional fuels through subsidy cuts, the economic viability of renewable projects may likely jump from the current time frame estimated at 15 years to merely 5 years, according to the anonymous expert mentioned above. However, the downside of this measure, he warns, is that it will drive up unemployment, since cheap energy represents a competitive edge for small and medium-sized production facilities in Egypt. He adds that in a comparison with China, the labor force of the Asian country is equally cheap as that in Egypt, but incomparably more skilled, thus the country is successfully siphoning international investments away from Egypt.

While energy subsidies can and should be phased out, in the meantime, it is possible to boost energy efficiency levels and achieve almost the exact savings as subsidy cuts by introducing relevant training of the labor force and providing qualified supervision.

Energy efficiency, moreover, is a critical factor for the renewable projects as well. The problems posed by unqualified workers and equipment failures at conventional power plants may afflict on the production and transmission of energy at renewable facilities as well. Economic incentives for foreign investors seem critical as the Malaysian example shows. According to Reegle, the Clean Energy Info Portal, Malaysia provides import duty exemptions on energy-efficient equipment that is not produced locally, and sales tax exemptions on the purchase of equipment from local manufacturers. The policy means to insure that energy-saving methods are incorporated into renewables projects. However, the expert emphasizes, despite a plethora of economic incentives, foreign investors are likely to pull out of a country, if they find their projects are losing money over carelessness and waste caused by unqualified labor and inefficient facilities.

Making renewables energy efficient multiplies the competitive advantage of this energy source in comparison to conventional sources such as coal. The anonymous expert explains that coal is highly problematic in terms of efficiency, as fluids burn invariably better than solids, because oxygen can penetrate deeper into liquids in the burning process. It is possible to improve the efficiency of burning coal by grinding it up into dust, however, it results in yet more pollution, even with good grades of imported low-sulphur coal. Nevertheless, we should not do away with coal. Instead, as Arafa insists, we should improve the process of filtration of fumes from both high- and low-sulphur coal. An anonymous source adds that the Maghara coal mine in Sinai is not as high-sulphur as many think as the Israelis exploited it amply in the 1960s-70s, giving Egypt another avenue out of a dependency on energy imports.

Conventional Considerations

Although renewable energy projects are a sustainable vision for the future, the centrality of fossil fuels should not be detracted, some experts note. To some degree, renewable sources of energy are dependent on the conventional ones. Wind power, for instance, is an oil-hungry technology, reveals Abdel-Rahman, as 20 gallons of lubricants are needed for every 1.5MW produced by a wind turbine. Wind power plants cannot function without lubricating oil. Wind power thus presumes well-developed petroleum and chemicals industries. It appears that fossil fuels are here to stay, at least for the foreseeable future, the expert says.

A complementary relationship between conventional and renewable sources of energy certainly exists between the oil industry and geothermal energy, the anonymous expert adds. In the course of exploration work, oil companies collect geothermal data regularly by tapping into volcanic heat that can often be found some 35km below the seabed with active underground volcanoes. Geothermal heat is a major source of power for New Zealand, for instance.

A problem with geothermal data in Egypt is of a bureaucratic nature. The collected data are not readily handed over to the Ministry of Petroleum with seismic and well data, when concession contracts expire. A source from the business sector explains that the ministry's priority is to minimize its cost-recovery, and thus the authority tends to derogate the importance of geothermal data. A petroleum expert adds that even when the geothermal data is collected it is not necessarily shared with other ministries and government agencies, as was the case at the time of Sameh Fahmi. This policy undoubtedly slowed down the drive for the utilization of geothermal resources. Currently, the GANOPE company is working in this domain in cooperation with Emirati Inmaa Al Ain in the new Gulf of Suez annex.

A lack of available data may be alleviated using satellite surveys to collect information from quarries and mines. But transparency in the process is also called for. Having a good technological and regulatory support system in place beforehand is what allows for conventional sources of energy to be able to work in parallel with and even support renewables. In turn, renewables free up oil, gas and even coal from electricity production and redirects the resources towards chemicals processing industry and export potential.

Following the recent Eni-mega-gas find in the Mediterranean Sea, and a trend to pursue clean coal as a viable industry for the country, environmentalists in Egypt fear that the renewables era may be delayed further. An energy transformation in Egypt will thus remain at risk, unless the government becomes aware that policy is the fulcrum towards pursuing a balancing act that incorporates renewables and conventionals into a single sustainable mix.

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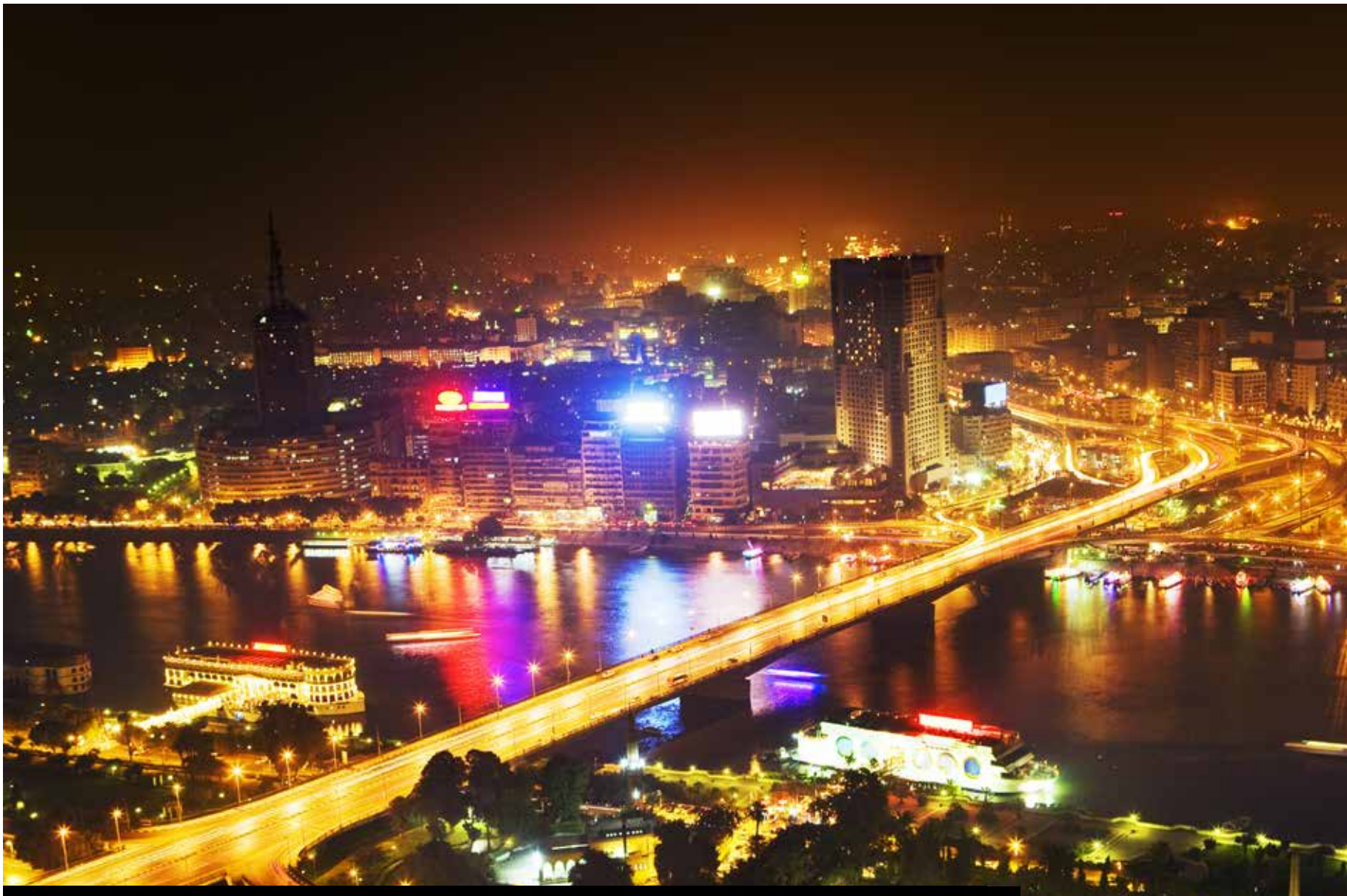


Efficiency Plan: Resolving Egypt's Electricity Crisis

By Emad El-Din Aysha, PhD

Egypt has committed itself to generate 20% of its energy from renewable sources by 2020, a target that the country's renewables experts have gladly endorsed. Nonetheless, these self-same experts argue that "energy efficiency" is the more pressing priority for satisfying Egypt's power generation needs, rather than renewables. Dr. Ehab Abdel-Rahman, Professor of Physics at the American University in Cairo, uses a simple analogy to illustrate this.

If prices go up should the average citizen borrow money and fall into debt or go through his accounts and cut spending? Obviously people should change their spending habits, and Abdel-Rahman is saying this, as the AUC's Vice Provost for Research and Acting Director of Yousef Jameel Science and Technology Research Center, someone who is dedicated to promoting renewables and especially solar power in Egypt. Another renewables expert, Dr. Mohamed Bayoumi of the Cairo Office of the UN Development Program (UNDP), elaborates further that any kind of policy "prioritization" is always governed by cost-effectiveness, and the timeframe for projects. Energy efficiency measures take less time and are more cost-effective, meaning also that the "returns on investment" are of shorter period than with renewables. LED lamp conversions, for instance, can take place in few days with a return on investment of a year or a year and a half.

The more power saved, the less strain on the power generated through renewable energy, Bayoumi adds. The question then is how to devise policies that are feasible, effective and sustainable, while also determining how to measure their impact and identify key players in the efficiency game. Then, and only then, can Egypt shift gears and pursue renewables in earnest and on a national scale.

The Root Causes

An energy efficiency expert, preferring not to be quoted by name, goes even deeper in this regard. 50% to 60% of Egypt's power problem is really an efficiency problem, he says, adding that the solutions are administrative, not financial – proper training and supervision, or "quality control." The critical thing to realize, he says, is that power savings do not just apply to the consumer but the producer as well.

In Germany 1KW of electricity costs 6 cents of a euro; with taxes this becomes 15 cents. In Egypt the figure is closer to 45 pence from the pound, and that is before taxes kick in. This is because the staff at power plants is badly trained and there are all sorts of equipment failures – overheating, problems with cables, lack of maintenance – that leads to energy being wasted, and inflating the price of the finished good that is later subsidized to incur an additional financial burden on the state budget. He added that global "best practice" benchmarks exist that set out standardized efficiency measures, both for power plants, as in how much fuel is used to produce 1KW, and for consumers, as in how many KWs are used to produce a ton of steel or cement.

The trouble is in the Egyptian power sector, these figures are never stated beforehand, and failures are never advertised, even internally. The people that get blamed, he further revealed, were the petroleum sector. He was cautiously optimistic, adding that the government contracting Siemens and GE to build energy efficient-power plants was step in the right direction, but that transparency and coordination between the different stakeholders in the energy sector was the ultimate recipe for success.

We can add a series of technical solutions, citing Electrical Engineer, Mohammad Tarek. He explains that every power plant has to face these all too common problems that waste electricity. There is "voltage stability," jumping up and down, which can damage all manner of plugged-in devices used by the consumer. There is the "power factor" problem, where excess electricity is often sent out from the power plant and

consumed, for free, since it hasn't been contracted for beforehand. There is also the issue of "wave harmonics." Instead of a pure sign wave you get noise which affects the efficiency of motors and other devices powered by electricity. Finally there is summertime "humidity," which introduces other problems to voltage stability for power plants.

Fortunately, there are affordable solutions to each and every problem, and from his experience, many of these problems are in fact being solved, in the current period. A bonus can be charged for any extra electricity transmitted to a customer, filters can be used to clear out noise along with proper maintenance of cables and the electricity grid, and heaters can be used to deal with humidity. As for the voltage problem, either the consumer can employ a dynamic voltage regulator or power plants can use a load tab charger.

Thinking in Steps

At the level of energy wasted by the consumer, Abdel-Rahman reveals a surprisingly effective way to reduce the electricity bill is building codes. Electricity is wasted on air conditioning (AC) due to the differentials between the temperature inside and outside an apartment, a house, or an office. Egypt's building codes actually account for such differentials – insulation, building materials, air-leaks, etc. The problem, typically, is that the codes have yet to be implemented and enforced.

Bayoumi adds that lighting only accounts for about 10% to 20% of electricity consumption, while the bulk is taken up by AC. What the UNDP discovered was that by using LED lamps you can cut down on total electricity usage by 20-40%, because traditional lighting heats up the air to that extent. By his estimation it could only take 3 years for lighting conversion nationally, resulting in an annual 5% electricity savings. But meeting deadlines is critical. If the conversion takes 7 years then the savings will only be 1-2%, hardly noticeable. Energy efficiency, as well as renewables, have to be an entire process not a one-time intervention, he explained. The stages involved should begin with lighting conversion, followed by simple, inexpensive technologies to cut down on electricity usage like solar-water heaters, followed by renewables solutions like photovoltaic (PV) solar panels.

Greece and Cyprus both have learned to do without electricity for heating water, utilizing solar-water heaters instead, but with rigorous supervision. There is already an energy efficiency standard and labels program for home appliances, initiated by the Egyptian Organization of Standardization in cooperation with Ministry of Electricity, and with project support from the UNDP Energy Efficiency. The program, for the moment, covers AC, refrigerators, washing machines, electric water heaters and lamps.

UNDP also has a project with the Electricity ministry to establish testing labs for electrical appliances in the New and Renewable Energy Authority (NREA), with two additional standards for dish washers and fans in 2015 with plans to establish the relevant laboratories. Standards for more appliances are expected to be issued in 2016, says Dr. Bayoumi.

Sharing the Burden

Citing the UNDP also highlights the point that non-profit organizations can contribute to energy efficiency, whether in tandem with governments and the private sector or by themselves; a mix of such bodies is also called for. UNDP is more of a coordinating agency and a technology facilitator, explains Bayoumi, bringing in much needed knowhow and technologies from other quarters. It does not, however deal with research and development (R&D).

Organizations like the British Council can help fill this energy efficiency research gap, and specifically it's Newton-Mosharafa Fund. Querying the Fund's director, Michael Houlgate, you find their work covers everything from technology solutions, such as designing more efficient solar cells – electrical efficiency and reducing materials costs – to work on designing energy efficient-housing units for low income communities, specifically through better insulation and building materials. R&D also means coming up with country-specific technologies that can be produced locally in collaboration with centers of learning abroad. This was the case with the University of Nottingham and South Valley University when it comes to solar cells, he said.

The EUREM (European Energy Manager Training) program at the German Chamber of Commerce also deserves special mention, focusing as it does on providing both technical and business services whilst targeting a different category of social actors. Lead trainer Ahmed Yousef Ezzeldin explains that the "intensive" course provided by EUREM covers energy efficiency, R&D, training in risk-management, feasibility studies, and supply chain management for all measure of energy-related projects. And instead of focusing on raw graduates they train seasoned engineers in the public and private sector; the course is so intensive even some of these experienced engineers fail. The objective is to provide Egypt with internationally certified "European energy managers" at the level of decision-makers in the field, such as company heads and public officials. These are the people who can make a difference on a daily basis, and the program instructors often include former and current decision-makers, in and out of government.

Another distinctive feature of EUREM is that it does not just network with centers of higher learning. The real networking benefits come from the certificate holders themselves. The program keeps in touch with the graduates, keeping track of their careers and achievements in efficiency and energy-related fields while providing them with studies, data and even technology to help them in their chosen occupations. They, in turn, feed the knowledge community that is formed. A EUREM manager can deal with everything from: air-conditioning (again) to refrigeration (as used in LNG); thermal engineering (in factories); Green IT design (covers emissions and engineering analysis); renewables (wind, solar, geothermal, biomass); and optimization (in electricity).

Ezzeldin knew from his personal experience of manufacturers and construction companies that had set up their own in-house energy departments, making tremendous savings. They had been so successful, in fact, that they were able to issue IPOs and had expanded regionally, garnering partners now that they met ISO-energy efficiency standards.

A Measure of Success

The anonymous efficiency expert went on to say that even with the Eni mega-gas find, Egypt cannot attain energy self-sufficiency if 60% of those gas reserves are wasted due to the inefficiencies with the existing power generation/transmission system. That gas is better used to feed industry and for processing into plastics and fertilizer to generate revenue streams for the country and earn hard currency that can then be ploughed back into, among other things, renewables.

A further measure that can be taken to ensure consumer savings, he said, was to make supplying subsidized gas to factories conditional on meeting the efficiency benchmarks outlined above. If they do not, then they can be forced to pay the international price of gas instead.

Broader measures for energy efficiency at the national level also exist, he added, such as "specific energy consumption" – how many KWs are used per person or sector or household. The important thing here was national comparisons, as was the case with Germany. Efficiency savings are not as easy to measure as the power contribution of renewables, that is true, but they can be incorporated into renewables calculations, he said, citing Malaysia as an example. Building codes there made customs and tax exemptions for energy efficient ACs, lighting, refrigerators and solar-water heaters – provided a building enjoys a Green Building Certification, according to the reegle Clean Energy Info Portal.

Such spurs to efficiency are what make renewables in the housing sector commercially viable, he explained, a necessity if building codes stipulate that at least 20% of electricity used by a building is generated from renewable energy. This is a policy option already being looked into in Egypt. The expert insisted that strict oversight would not cost the taxpayer anything. Under Abdel Nasser civil servants were forced to put on plains clothes and go out into the marketplace to insure that the price control for bread and essential items (including cement) was in fact being implemented. This was part of their duties so that no extra pay was involved. In Germany you cannot even hire a construction crew to build a house without having them checked out through a rigorous set of regulations governing technical qualifications. But, at the end of the day, this comes at no extra cost to the homeowner. A more proactive approach used in Malaysia was to regularly showcase success stories and model programs for energy efficiency during awareness campaigns.

Almost in anticipation of the legal dispute with East Mediterranean Gas Company, the expert said that a combination of efficiency and renewables could do more than garner Egypt energy independence, but allow it to become a regional electricity hub exporting to the surrounding region. With will power, proper planning and active participation everything – in principle – can be accomplished.

Interconnectivity: Egypt's Aspiration for Regional Electricity Hub

By Nataša Kubíková

Egypt has eloquently embarked upon the aspiration to become a leader in electricity transmissions scheme in the Middle East, Africa, and potentially Europe.

While Egypt's proximity to the targeted areas suggests potential, the goal is necessarily bound to the country's limited resources and capabilities that are further restraint amid growing domestic electricity demand greatly outbalancing supply. Cairo will need to find channels to boost its lacking domestic capacities in the upcoming decades. The vision to become an interregional electricity hub will thus likely remain contingent upon external intervention and aid provided by other established and technologically advanced actors in the sector in the region, namely the GCC Interconnectivity Grid (GCCIG).

Egypt's limited independent capacities on the financial, technical, and natural resources levels have recently marked a significant shift as Cairo has attracted large foreign direct investments and loans in the energy sector. This is a positive start for attempts to improve country's electricity infrastructure and secure its self-sufficiency. The financial support flew in mainly from the Gulf region, which appears to be expanding its outreach rather than creating a new regional hub. Egyptian government's projection thus seems unlikely to materialize in the foreseeable future amid the current regional competition. Instead, it seems that Egypt will, for the time being, serve as a service hub for the expansion of GCC's dominance in the interconnectivity market.

Understanding the Benefits

The electricity interconnectivity scheme is based on a smart grid system that bears multiple advantages. It unlocks cost savings in energy industry, offers flexibility to tackle demand-supply imbalance, guarantees security and reliability due to high quality technology, creates common electricity market that allows countries to use low-cost generated electricity in peak times and sell electricity surpluses, and provides opportunities for cross-sectoral utilization.

The Arab Fund for Economic and Social Development (AFESD) accounts for the interconnectivity benefits: "There are multiple advantages to be gained from interconnecting the electric power grids of several countries. The main benefit comes from deferring, or avoiding altogether, the construction of new power plants. This can be achieved by sharing power across interconnected grids without impacting their security and reliability. The interconnection also reduces the need for standby capacity to meet fluctuations in demand, which in turn reduces operating cost. It enables new generating plants to be erected in the most economically attractive sites, typically close to the sources of inexpensive fuel. A further benefit is the lowering of the overall level of environmental pollution in the region."

The designed smart grid system provides a structure that saves capital investments for the construction of national energy infrastructure. The existing GCCIG system is calculated to "save countries up to $3b in capital investment by avoiding the need to build more than 5GW of generation capacity over 20 years. Operational and fuel efficiency savings across the system will amount to at least $300m, based on feasibility estimates to 2028," GCC Interconnectivity Authority's (GCCIA) CEO, Ahmed Ali Al-Ebrahim explained for press.

The smart grid system's technological structures also allow for a large degree of adaptability and flexibility. A key advantage of the system's technological capabilities is to counteract major load shedding and thus enable rationalization of resource spending. The technological advancement has achieved greater electricity transmission stability and security. It has been designed to provide fast-pace diagnosis of faults at the interconnected stations even in distant locations, and thus allow for almost real time decision-making to counteract errors and protect the network. High Voltage Direct Current (HVDC) interconnecting stations secure transmission in diverse environment with different load frequencies and fluctuating demand, without generating excesses. Simultaneously, the smart technology allows independence of interconnected networks in different regulatory, technical, and economic environments. Lastly, it enables to incorporate renewables into the system without disruptions in line with energy diversification policies of the GCCIA's member states and in the wake of concluded global accords on climate change protection.

The long-term benefits of smart grid schemes seem to outweigh fast-paced short-term investment solutions through national structures that rely on momentarily available resource capacities such as coal-fueled power plants.

Geography Moulds Prospects

Making smart grids operational across larger geographical territories poses a major challenge. A solution can be found through improvements required for such a mega-scale endeavor. The improvements relate to network's security and reliability, control and management, geographical positioning, and expanding capacities.

In line with the goal to ensure security of interconnected grids, a series of studies was conducted comparing the AC, DC and AC-DC hybrid power grids system operations. In a recommendation issued by the International Electrotechnical Commission, the use of hybrid power grids based on UHV AC interconnection and DC transmission was graded as an efficient tool to improve the grids' reliability.

The Electrical Energy Storage (EES) system may also help to further tackle the inevitable dynamics of the smart grid operations when addressing the issue of time mismatches defined by geographical positions of connected countries. The EES is able to store electricity obtained at lower price generated during off-peak hours to be used at peak times,

decreasing the total electricity costs. It is also designed to supply electricity during network failures caused by external factors such as natural disasters. The EES helps to maintain and improve power quality, frequency and voltage through a technologically advanced system balancing differences among in national grids generation. A possible improvement to the supra-regional grids' operation is to interconnect the EES installations that were created as so called microgrids or small-scale storages on national and local levels. This integration of storage systems with different technologies into a single virtual store may then be more beneficial.

The management and control of the super-smart grids in larger geographical schemes is crucial. The transmission networks are equipped to obtain extensive data set for measurement purposes. Technically, they are capable of processing the measurement values in real time and suggest load flow solutions through algorithmic estimations. The network thus optimizes load flow to find a balance, where the capacity of all operational stations is evenly utilized to satisfy individual demands.

Another challenge to introduce smart grid solution to a bulk power transmission networks across multiple countries is to shift from a quasi-static state of transmission between currently functioning two state connections into a complex and dynamic system that requires upgrade in management functions above all. The smart grids to be operational in larger geographical areas are thus recommended to extend their control mechanisms using the Phasor Measurement Units (PMU) that will help to reduce blackouts, power outages. Once management gaps are resolved efficiently, the grid would be able to accommodate the transient behavior of the net, on top of providing the power, voltage and current measurements.

Necessary requirements for future interconnectivity structures to function efficiently relate to a set of parameters such as power quality, voltage tolerance, frequency, synchronization, and metering. In line with efforts to set up a supra-regional structure, the International Electrotechnical Commission (IEC) recommends that it is necessary to rebuild the Transmission & Distribution grid, install new generation control systems such as Flexible AC Transmission Systems (FACTSs) and High-Voltage DC (HVDC) Systems to make the grid fully functional. The IEC also promotes the Wide-Area Monitoring, Protection and Control (WAMPAC) scheme that will guarantee cost-effective solutions and improve functionality, reliability and security of the grid.

It is further required for such a scheme to be able to balance diverse socio-economic conditions and regulatory-bureaucratic environments of member states. While GCCIG has proposed a doable plan within the Gulf region, it will face a series of difficulties in its attempt to accommodate diverse environments that the compartmentalized African and European markets entail in order to set up a fully functional supra-regional electricity smart grid.

Relying on GCC Lead

A number of regional actors have expressed aspirations to establish such a supra-regional smart grid. Most notably, GCC countries have been promoting a closer integration of diverse electricity generation environments. The six GCC members have successfully completed the construction of a transmission networks system in 2011. The GCCIG worth $1.2b is connecting national power infrastructures to a unified super power grid with a total capacity of 1,200MW.

Since its completion, eleven MENA countries requested to be connected to the network to exchange electricity in peak hours. The goal is to create a ring of interconnected power grids in the Mediterranean region stretching to Morocco in the west, reaching to Europe via Turkey, and creating a gate to the African market through Egypt. According to GCCIA Chairman, Dr. Matar Hamed Al-Neyadi, quoted in Middle East Monitor: "The [GCCIA] authority is planning to expand the network to reach the European market by creating a market for energy trade with EU countries via Turkey."

The project has become a crucial integral part of the strategic regional solution, and it employs the most innovative technologies. GCC Interconnectivity Authority's CEO, Ahmed Ali Al-Ebrahim, told press: "Building an entire grid system from scratch means there are no legacy systems to negotiate. It is the first-ever project in the GCC and the Middle East to use HVDC technology."

The project became the first of its kind in the region projecting massive economic benefits as the GCCIA introduced an in-kind energy-for-energy trading scheme in early 2015. The GCCIG sub-regional energy interconnectivity system has thus opened up a path to the formation of regional electricity market that will be protected from fluctuating global dynamics. The in-kind approach aims at overcoming economic disparities given by different levels of energy subsidies, pricing, and regulations of member states circumventing the bureaucratic obstacles. It enables the involved countries to secure sufficient electricity supply to their domestic markets binding them under mutual responsibility formula.

The move represents an upgrade in the process of setting up an interconnected supra-regional grid under the GCCIA's auspices in the future.

Egyptian Matrix

Given the existing capacities of Egypt and GCCIA's agenda for electricity politics, Egypt is likely to merely follow the lead of the established actors before picturing a future as an electricity hub in the region. Nonetheless, its position on the regional electricity market seems to be improving.

The Economic Development Conference in Sharm Al-Sheikh in March 2015 concluded a series of investment deals for Egypt in light of its need to build up to 5.2 GW worth of generating capacity annually until 2022 to meet the massive domestic demand. According to publicized estimates, domestic electricity sufficiency is achievable by promoting energy efficiency, diversification of power generation, adoption of renewable mix into the energy production, and direct foreign investments of $5b per year for the enhancement of the national electricity structures. These steps would have to come ahead of any other expansionist plans.

Egypt has so far turned to the GCC seeking improvements in domestic infrastructure and linking them to prospective plans for the construction of interconnection networks. In line with the national energy strategy, a $1.6b project deal to build electricity connection with Saudi Arabia with a capacity of 3,000 MW was signed. The project envisaged to build up an infrastructure scheme consisting of two HVDC converter stations with 500 KV in the Egyptian Badr city, the antenna lines, marine cables leading through Al-Aqba Gulf, and two generator power stations in Al-Madina and Tabouk.

The Islamic Development Bank (IDB) has leased $220m in support of the project. "This connection or project will contribute in the future to integration with the electric grid of the Cooperation Council for the Arab States of the Gulf (GCC), as well as the Arab Maghreb area network, including increasing the potential of electricity exchange between Arab countries," an IDB statement read, cited by the Daily News Egypt.

"Through Egypt we can connect electrically with Jordan and North Africa and we will achieve this project within three years according to the agreements."

The Arab Fund for Economic and Social Development will finance the antenna lines through a soft loan of up to $160m, and the Kuwaiti Fund for Economic Development has pledged $100m in an additional loan. The World Bank will co-finance the project, for which Egypt has earmarked $600m.

The Saudi Ministry of Water and Electricity was reported by Daily News Egypt as stating that "it is a core project as through Egypt we can connect electrically with Jordan and North Africa and we will achieve this project within three years according to the agreements."

The investment flow targeting regional networks provide a solid foundation for the development of interconnectivity scheme. However, the funds for enhancing Egypt's domestic energy infrastructure before being able to contribute and benefit from regional networks seem to be limited. Attempts to meet the growing electricity demand are therefore supported through further bilateral investment deals as the EUR8b one for a joint venture between Egyptian El Sewedy Electric and German Siemens for gas-fired and wind-powered plants. While these contracts sound promising, fear remain over a lack of natural resources that had previously shut down energy production facilities in the country. The government is facing a conundrum that will likely delay the accomplishment of Egypt's vision for energy role in the region even more.

The disadvantageous factors for Egypt were partially resolved by the adoption of a new privatization law of the energy sector allowing private companies to link their operations to other energy providers on bilateral basis to counterbalance electricity shortages.

In an interview with Daily News Egypt, Egyptian Minister of Electricity, Mohammed Shaker revealed ministry's plans: "Goals include maximizing the use of all resources, encouraging the use of renewable energy, and promoting electricity interconnection. We also aim to improve the efficiency of energy production and its usage by adopting environmental protection policies and appropriate measures in the field of electricity generation and future planning to meet the rising demands."

Apart from Egypt's challenge to achieve electricity self-sufficiency, there are further major questions regarding its standing in the regional interconnectivity scheme. Despite its geographical position in a cross-road of energy corridors, largest obstacles relate to how the inflowing funds to Egypt are managed and distributed, what areas of development the international investment targets, and which alternative corridors may be more easily accessible to energy giants.

As the ongoing talks between Riyadh and Ankara suggest, Egypt may not eventually play any role in the European market, as GCC seems to currently prefer the northern way. The developed interconnection infrastructure in the Maghreb, that provides electricity shipments between Morocco and Spain, puts Egypt in disadvantageous position as well. Egypt is nevertheless likely to serve as a transmission point for GCC's future expansion reaching out to western and southern African countries. However, Egypt's current status prescribes its effort to be directed first to secure its domestic electricity generation capacity in order to qualify for a decisive role in the interconnection networks, before pondering any expansionist plans.

NeoScope: Sourceless Formation Evaluation while Drilling

Schlumberger

Avoiding chemical sources saves time and money logging a directional well in Egypt

New sourceless measurement capabilities have become available in a unique logging-while-drilling (LWD) service based on pulsed neutron generator (PNG) technology. The NeoScope formation evaluation while drilling service provides a comprehensive sourceless petrophysical description of the formation in the shortest multifunction LWD collar available. Eliminating the need for chemical sources reduces drilling risk and handling costs, and also avoids potential delays related to local permitting and regulations.

Nuclear logging

PNGs have been successfully used by the well logging industry to acquire a variety of measurements. This radioisotope-free source of high-energy neutrons has been in use for decades in wireline-conveyed logging tools for various commonly used measurements, such as neutron porosity, spectroscopy and thermal neutron capture cross section (also known as sigma). These are all acquired without the need for chemical sources such as americium-beryllium. Recent developments have extended the suite of measurements to include a radioisotope-free bulk density measurement, eliminating the need for cesium sources. This density is referred to as the sourceless neutron-gamma density (SNGD).

Radiation sources

Radioactive materials present risks to health, safety, and environment (HSE), whether through direct contamination or extended close contact with the human body. Abandonment of a chemical source downhole can present a potential environmental risk that can last hundreds or thousands of years. Government regulations rightly consider that the industrial use of these materials requires stringent control. Service companies apply tight controls and comprehensive training programs to ensure strict adherence to procedures that minimize operational risk. These are particularly important in LWD operations due to the severity of the drilling environment and because rig personnel often assemble the tools in the bottomhole assembly (BHA) onsite.

Several technologies have been implemented to minimize human exposure to radioactive materials and maximize the ability to safely retrieve sources when tools become stuck downhole. Nevertheless, the use of chemical sources inherently poses a risk, and the opportunity to entirely eliminate the need for them provides benefits not only for HSE risk reduction, but also for improving operational efficiency and avoiding restrictions and delays relating to compliance with local legislation.

Non-chemical alternative

A PNG can provide a safe alternative to chemical sources. A PNG is, in effect, a miniature particle generator producing neutrons by accelerating hydrogen ions across a minitron. PNGs do not emit any external radiation when not electrically energized, so there are no restrictions on well site manipulation of unpowered PNG-based tools. There is no need to take any special precautions when assembling the tool into a BHA and no operational delays for source loading and unloading. Authorities such as the U.S. Nuclear Regulatory Commission have exempted them from any special precautions for abandonment in oilfield wells.

PNGs have been used in wireline tools since the late 1980s to provide sourceless openhole neutron porosity measurements, and the technology has subsequently been used to provide measurements of physical properties beyond those that can be made with chemical source-based tools. Neutrons are generated in carefully timed pulses, and the measurements are acquired in specific time-gates using an interlaced timing sequence, enabling measurement of sigma (thermal nuclear capture cross-section) and spectroscopy (for elemental concentrations and formation mineralogy). These measurements are now available in both LWD and wireline applications.

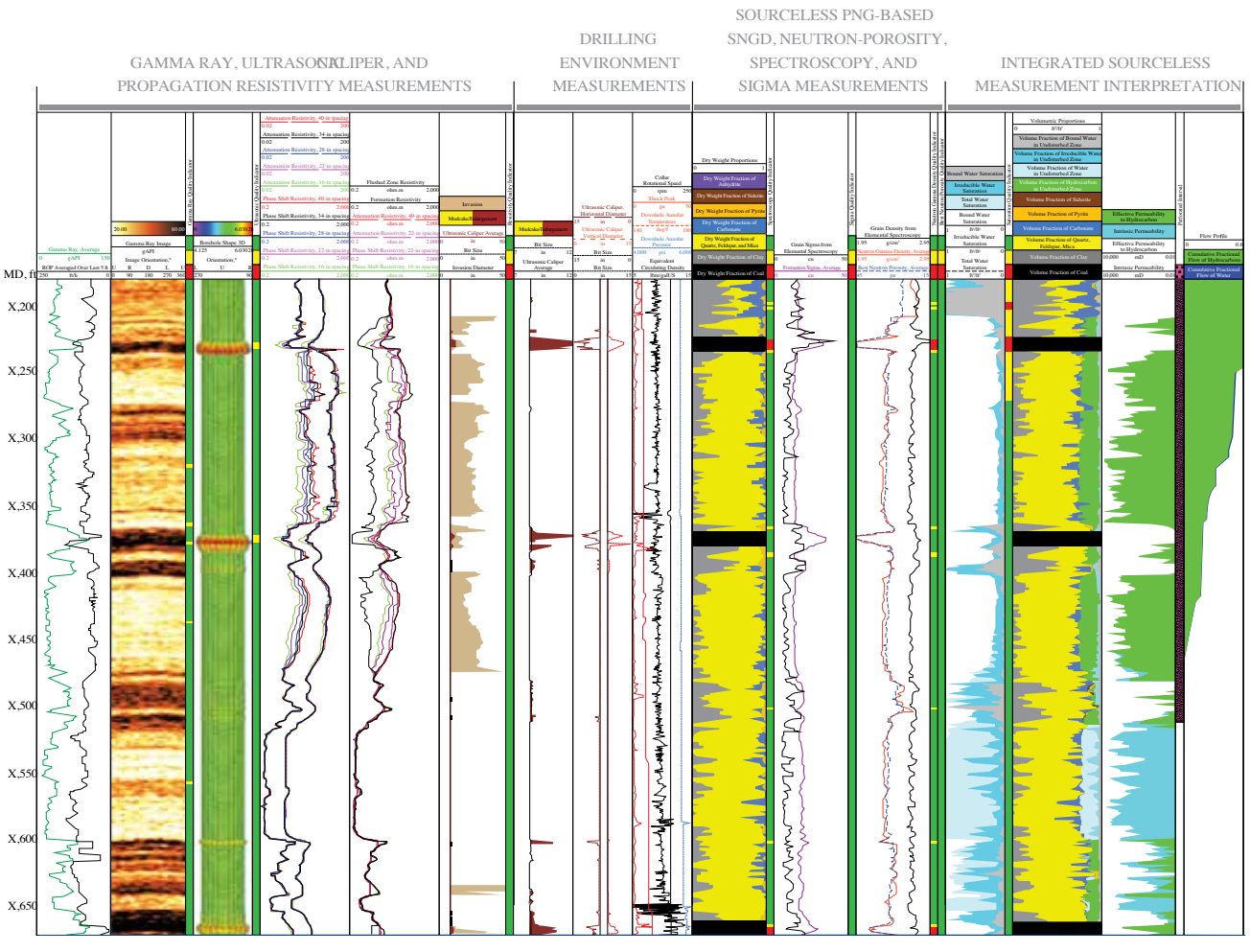
The principal operational hazard of PNG-based tools is the emission of large numbers of high-energy neutrons when they are powered. Wireline tools have software locks on the power supply that can only be released by human control and also only when depth measurements confirm they are a safe distance below the surface. The NeoScope LWD tool and its PNG can only be powered when the turbine from the measurement-while-drilling (MWD) system is energized by mud circulation. Therefore, the PNG generates neutrons on demand and ceases emission when turbine power stops. Additional hardware and software safety control mechanisms include pressure-controlled shutdown, a physical field-neutron-plug required to enable the PNG, passwords and sequential logic. The combination of safety interlocks prevents accidental operation at the rig floor and ensures zero emissions if the tool has to be abandoned downhole.

The use of the sourceless LWD service removes the need to conform to stringent regulations in transportation and storage that can lead to delays. It also reduces risk if tools are lost in hole, as chemical sources incur costly abandonment measures and require sidetracks to deviate a safe distance from the lost tool. With a PNG source, tools can be handled or abandoned without special safety considerations, and sidetracks resumed closer to the originally planned trajectory.

New sourceless neutron-gamma density measurements

Schlumberger has developed new technology that, for the first time, provides reliable SNGD measurements without the use of a chemical nuclear source. Using the PNG and a suite of detectors, the NeoScope tool determines SNGD from the gamma rays induced by the interaction of high-energy neutrons with the formation. The SNGD can be used to replace the traditional gamma-gamma-density measurement. Through the past decade, extensive studies have characterized the SNGD measurement in a wide range of formations and environments. The new measurement enables a comprehensive, sourceless, petrophysical description of the formation using the shortest multifunction LWD tool available. A single 25-ft collar provides azimuthal natural gamma ray, array resistivity, dual ultrasonic calipers, a full drilling mechanics package including annular pressure and near-bit-inclination and sourceless PNG-based measurements such as capture spectroscopy, sigma, neutron-porosity, and neutron-gamma-density. All of these measurements are acquired within 16-ft of the bottom of the tool, providing the full suite of data close to the bit.

This compact design reduces the amount of rathole by providing comprehensive formation evaluation measurements close to the bit. Collocation ensures that the measurements are acquired under the same environmental and formation invasion conditions, reducing uncertainty in data interpretation. Since there is only one collar, flat time associated with making up and breaking down the BHA is reduced. Having fewer connections also enhances BHA reliability. The service's large memory capacity allows the recording of two samples per foot at rate-of-penetration up to 200 ft/h while providing accurate formation evaluation measurements. High real-time data transmission rate, provided by the TeleScope high-speed telemetry-while-drilling service and its Orion II* data compression telemetry platform, ensures that the full suite of measurements is available in real time to improve decisions and mitigate risk.



INTERGAS - VII

Linking the Experts to the Goal

On the 24th of November INTERGAS VII Oil, Gas & Petrochemical Conference, one of the more prominent events in the petroleum industry, brought together leading executives under one roof, with the purpose of exchanging ideas, networking and more importantly, discussing the future of the Egyptian industry at this crucial time. Egypt is currently in the process of expanding its energy mix, dealing with shortages in foreign currency and energy, not to mention the governments work on economic reform through the implementation of changes in the industry.

The event was opened by Ahmed Shiha, Chairman of EIF, who delivered the speech of Mohamed Al Masry, Chairman of the Egyptian General Petroleum Company (EGPC). The speech began by noting that the Egyptian energy sector, during the last period, has seen many actions that contributed to the country's economic reform, such as the restructuring of subsidies, approving the draft law for the launch of the gas regulatory affairs, which will allow private factories to import their own needs of gas; in addition to reducing dues of foreign partners by half, encouraging the acceleration of field developments and production process, signing of new exploration agreements, and securing sufficient sources of energy through imports.

The opening speech also highlighted Egypt's largest gas discovery to date, Eni's Zohr field. "Zohr discovery is the result of the continuous hard work and successful partnerships –here we talk about ENI- demonstrating confidence in the Egyptian economy, and the political and the economic stability," said Al Masry.

The government has made it clear over the past few months that it fully intends to turn Egypt into an energy hub, both gas and electricity. The location of Egypt aiding the achievement of this goal was pointed out in Al Masry's speech.

"I would like to emphasize that the government is aware of the challenges ahead but it is also very determinant that we meet the expectations of the Egyptian people and build up a sustainable future which is very important for the Egyptian people," he concluded.

The second speech was presented by Aiden Murphy, VP Country Chairman & Managing Director, Shell Egypt. He began by explaining Shell's long term vision for its ventures in Egypt. Murphy then noted the dilemma imposed due to the increasing energy demand, and the corresponding environmental challenges that the country is facing when meeting this demand.

"Diversification of the energy mix has to be mobilized to meet demand and this is where gas has a critical role to play," said Murphy, pointing the good standing of Egypt's reserves.

"LNG has a critical role to play as it provides supply security for Egypt and bridges the gap between grown demand and available supply. […] As a global leader in LNG, Shell will continue to work with EGAS to support Egypt's energy security," confirmed Murphy.

Murphy went on to note that Egypt can monetize its reserves by unlocking more difficult protocols, and liberating exiting infrastructure. "To be more precise, our gas fields within the existing Western Desert production sharing contracts cannot be commercially developed under the current licenses term," he said adding "it is important for the government to work with downstream investors such as Shells to develop such challenging resources. In some instances, requiring new development terms to reflect the higher cost of production."

He ended his speech by pointing that the role of natural gas cannot be taken for granted, saying that policy makers have a unique opportunity to ensure the policies and regulations that recognize the many benefits of natural gas.

The Head of the Economic & Commercial department at the Italian Embassy, Pietro Tombaccini, took the stage next. He began his speech by noting the benefit of events like Integas VII in helping to address Egypt's energy needs. "The energy mix is actually a key factor for economic growth, together with universal access to energy, developing cleaner and more efficient systems, and restructuring the mix of energy sources," said Tombaccini.

He discussed the need for a coherent energy policy framework to deal with Egypt's increasing population.

"If I can add a personal note: I have been here for only 3 months now and I am still quite shocked when I see polar temperatures 24 hours a day in shops, cafes and restaurants. There should be a limit to such a waste of energy," pointed Tomaccini.

He then moved to a broader focus, discussing Egypt in terms of the North Africa, and the Mediterranean region, explaining why hydrocarbons will remain key to the countries of the region, particularly for a country like Egypt.

"I wish to confirm the Italian full backing of Egypt in energy sector, in terms of technical assistance, technology, know-how transfer, construction, and financing of strategic infrastructure," Tomaccini concluded his speech.

Meanwhile, Eng. Mohamed AL Masry, gave a brief press conference after finishing a tour of the exhibition, greeting exhibitors.

Eng. Khaled Abou Bakr, Chairman of the Egyptian Gas Association (EGA), and Head of TAQA Arabia, began the second series of sessions. The speech began with an explanation of the role of both the EGA, and its parent association, the International Gas Union, which he acts as its Middle East and North Africa Regional Coordinator.

"The global gas market is encountering numerous challenges in an overall growth context. Whether the current weakness is cyclical or structural remains to be seen," said Abou Bakr.

He noted that the lower oil prices are providing quite a challenging environment for project development; pointing out the need for business owners to develop new business models.

He discussed the East Mediterranean region, noting the sufficient reserves for the growing needs of the area.

"The reserves provide an opportunity to improve geopolitical tensions, improve the quality of life, present a good source of government revenues and can be used as a tool for regional peace," said Abou Bakr adding, "excess reserves can be exported, however for efficiency, they will likely need to be brought to a single hub: Egypt being the most logical location."

Discussing the dilemma presented by conventional energy methods, Abou Bakr said "fossil fuels are attractive not only because they are available and relatively inexpensive but also because we have learned to use them so effectively. Concern about the

climate however may ultimately limit the use of them."

Abou Bakr concluded his speech by explaining the current energy mix, which stands at 50% gas, 45% oil, 3% renewable, and 1% coal. He supported diversification of energy resources to ensure energy security. Abou Bakr said that the ideal scenario for 2025 from his perspective stands at 45% gas, 15% oil, 20% renewable, 10% coal, and 10% nuclear.

The following speech was presented by Christoph Schilchter, Senior Vice President of Production for North Africa, DEA. He began his speech with an overview of DEA activities in Egypt.

Schilchter focused the remainder of his speech on possible ideas to encourage further investment for Egypt. One of the suggestions was to develop concession models which allow faster cost recovery of investments, enabling and extending field life in the last production phase; other suggestion was to continue liberalization of gas market and gas pricing, improve possibilities to hire the best local talents and to support them with highly skilled and experienced international staff, improve project governance bad commercial terms allowing faster project execution and development of marginal fields, and finally to secure more reliable cash flow and contractual payments to international production sharing partners to be received without delay.

Following Schilchter, was the Managing Director of Qarun Petroleum Company, David Chi. His speech revolved around what investors look for and the suggested recommendations. Chi, explained that investors are in search of fair sustainable and competitive return on investment; safe, stable, political, economical and social environment; easy and streamlined operating environment; and an ability to get paid and repatriate the profits.

A key recommendation was continued reduction of subsidies, further payment of dues, additional bid rounds, increase in gas prices, additional reform, among others.

"Great opportunities exist for Egypt, the government and investors can, and must work together as partners to create a win-win relationship to realized the nation's full potential," he concluded.

The last speech of the day was by Gabriel de Lastours, Senior Banker at European Bank for Reconstruction and Development (EBRD). "Egypt must consider increasing the domestic gas price, this is something that we see as extremely positive, and will promote domestic production, reducing at the same time the need for more expensive energies," de Lastours said.

He pointed out that gas flaring is a huge waste for Egypt, equivalent to 4% of the country's electricity production. "In order to recover all the gas currently flared and expected to be flared over the next 5 years, $4b investment would be needed. So this is one of the reasons why we think gas price should be higher," he concluded.

The second day began with a session on "Capitalizing on Opportunities in Egypt's Downstream Sector: Modernization, Expansion and Enhancing the Value Chain." Pakinam Kafafy, CEO of TAQA Arabia, opened the session with an overview of economic indicators for Egypt. She explained that the expected population growth rate for 2015/2016 is 2.6%, while GDP growth is expected at 3.8%, thus boosting Egypt's GDP per capita by 2.2%. "These indicators show that the energy sector will boom in addition to the explorations and current reforms," said Kafafy.

Kafafy then moved to discuss TAQA Arabia's major targeted customers, beginning with the major energy demanding sector, electricity. Discussing power plants that use diesel she said "In the next three years we are looking to change [from diesel use] to the new mobile CNG to be green and to work with a more efficient product." TAQA is also working on two 150 MW solar plants. Kafafy said that the company is aiming for its energy mix to be mostly focused on green energy and natural gas, rather than mazot (fuel oil) and diesel.

Other sectors the company is targeting are residential and industrial. Exploring the dynamics of those two sectors, Kafafy said "although the residential sector is only 3% of the consumption of gas, this is the main and important sector that we would like to go from LPG to natural gas. You can see that each house you convert from LPG to natural gas will save the country around $200 per year per home."

When addressing the industrial sector she said "currently we have 2,296 factories supplied by gas, 70% are high intensive users and industrial is growing by 6%." The speech went on to discuss how most factories are not operating at 100% capacity.

The second speaker of the session was, Basil El Baz, Chairman of Carbon Holdings, the speech revolved around the role of petrochemicals in the Egyptian economy. "The only way Egypt can move up towards an acceptable per capita would be through capital intensive manufacturing; and to engage in capital intensive manufacturing, that means that we must put on the ground here today, raw materials-mainly, petrochemical products," he said.

El Baz stressed during his speech the importance of producing raw materials in Egypt, and moving up towards expanding the list of locally produced finished products. "What can we say today is 'Made in Egypt?' Very few products, which in turn means there is tremendous opportunity, because it is not as if we attempted to put in place raw materials and it didn't work – we never tried," he said, adding that the process if we begin today should take up to 10 years.

"Producing enough raw materials to you [Egypt] can attract any kind of industrial manufacturer to come and invest. And more importantly, to create a domestic manufacturing industry who will service our local economy. And with time our products will start to advance and will be competitive internationally," he concluded.

The second session of the day was titled "New Horizons in Egypt's Gas Sector: Optimizing Resource Potential." The first speaker to take the stage was Luca Bertelli, CEO of ENI.

Bertelli began his speech by stressing the importance of the relationship between Eni and Egypt. "We have a historical, long-term, win-win relationship with Egypt," he said.

After presenting an overview of the company's recent and very famous gas discovery, Bertelli went on to explain why drilling operations began prior to commitments. "Drilling before commitments existed was the result of a new investment incentive coming from Sharm al Sheikh [conference] in March of last year, where the Egyptian government showed proactively again in encouraging exploration, and development activities in the country. […] The new investment language convinced ENI to invest again in Egypt and immediately we achieved outstanding results."

He concluded his speech by noting that Zohr has the potential of helping Egypt become an energy hub, which he believes the country will eventually achieve, with the help of its unique location.

The following speech was presented by Amira El Mazni, Vice Chairman for Gas Regulatory Affairs (GRA), EGAS. El Mazni speech revolved around explaining the concept of the newly launched GRA, pointing that the purpose is to protect the consumer.

"Gas market reform is a task for the collective ministers in the Egyptian government yet the regulator will assist, and participate in setting the eligibility criteria for the various auctions. These auctions are based on level of consumption, or sector of consumption, or combination of both. The gas regulator will also participate in the auction for gas pricing," she explained adding "Market reform requires market opening and price reform. They go hand in hand."

Tarek Shalaby, Commercial and Business Development Manager for Edison International, took the stage next presenting a brief overview on the operations of Edison in Egypt. The company mainly operates in the Eastern Mediterranean and Gulf of Suez, and has recently received new concessions in the Mediterranean.

Edison has invested $1.6b in Egypt, where 54% of the company's production comes from. Making Egypt extremely important to the company's strategy, he noted. "Abu Qir is Edison's major play, which began in 1979. Over the past few years, Edison has drilled many new wells there," he stressed.

Ragnar Wisloff, CCO of Hoegh LNG, took the stage next. The company is known as the provider of Egypt's first LNG floating regasification and storage unit (FRSU).

"The world of LNG is today changing. We will, in the next few years, see 50% in addition to production capacity, mainly in the US and Australia. So the supply side is driving the change. In addition to that, we see changes to the technological field… There are many more tools available," he said.

Wisloff explained that FRSUs give any country access to worldwide energy, making the country's growth an easier task.

"The level of gas consumption and production in Egypt is on level with the large European counties and it has been an exhibit here in Egypt for a long time, and that means that EGAS is an experienced company. […] This has helped tremendously in the FSRU implementation," he concluded.

The final session of the day was titled "Unleashing Unconventional Potential in Egypt." David Ryan, Managing Director of ThyssenKrupp Industrial Solutions. The speech began by an overview of the company, noting that it focuses on smaller projects in its operations. "Smaller gas developments can ease your demand, they can be delivered and they can be attractive to operators. They must be followed to make sure of full use of a country's reserves," he said, pointing out that Small gas developments "can expand a country's technology base, whilst bringing gas to market will also up the speed of gas delivery."

The last speech of the day was by Mr. Mohamed Atwa, Production Technology Engineer at Kuwait Energy Egypt.

Atwa outlined Kuwait Energy's East Abu Sennan Gas Project in the Western Desert, describing Kuwait Energy's operations in this field from initial concept and evaluation to project development and completion. According to Atwa, the major challenges in the site's development were "permits," finalizing the agreement; "time," acquiring and installing new gas plant equipment; "economics," covering the cost from EGPC collection; and "integrity," overhauling facilities for employees. Atwa described the execution of the project in great detail, including the equipment and other necessary areas of site development. Despite delays for military contract approval, the site was completed on time and under budget, which Atwa credited to strong planning from the team and close cooperation with government agencies and other partner companies.

The third day of the Intergas VII Conference offered industry experts the opportunity to share, and hear information and experiences related to the Egyptian energy field. Atef Hassan El-Haddad, General Manager of the Abu Qir Petroleum Company began the morning with a discussion of his firm's methods for recovering natural gas reservoir fluids, which are in many cases unrecoverable, through the use of lean gas injections and CO2 sequestration. He was followed by Mahmoud El Geoushy from the El Mansoura Petroleum Company, who discussed the geological and development challenges of the Tineh field in the Eastern Delta.

El Geoushy was followed by Khaled Aboud, Global Business Development Manager for MCS, who spoke about the company's use of 3-D imaging for underwater structures and pipelines. He explained the technology's applications for the energy industry, including pipeline measurement, subsea installation support, subsea decommissioning support, underwater inspections and other subsea surveys. Next to the stage was Said Ahmed, of the Assiut Oil Refining Company, who gave a presentation on the use of Ployesteramide resin as a strong alternative to asphalt cement for industrial coatings.

Ahmed was followed by Mohamed Matbouly, Projects Executions Section Head with WASCO, who discussed project management in the energy industry. He outlined how standardization of project management can achieve high results despite the varying circumstances that affect the joint ventures of Egypt's energy industry. Next spoke Marzouk Abdel Wahed, Operations Senior with United Gas Derivatives Company, who discussed how the company's engineers solved gas recovery problems through a modification of liquid stream distribution to remedy these problems. Finally, Ahmed Sarhan of the Gempetco Operations Department spoke about the company's use of soda ash to dissolve gypsum deposits in the Gulf of Suez.

The event gave a positive outlook on the future of Egypt. There are definitely many challenges facing the country, but growth and prosperity are looming on the horizon.

The Changing Role of the CFO:

How Energy Transformation Is Shifting the CFO Focus

The world of electricity is changing fast. It's a transformation that is exercising a great deal of thought and action in the boardrooms of power utility companies whose traditional business models are under threat. Technological innovation is creating new choices for customers and new opportunities for a wider range of industry entrants. The combination of the 'push' of technology, the 'pull' of the customer and the threat that comes from new competitors poses questions that go to the heart of company strategies and the role of the CFO.

The chief financial officer (CFO) role is changing. It's becoming more strategically-focused, more value-focused and more future-focused. But the role of the power utilities sector CFO is changing faster than most. The ambit of the power sector CFO is not only being reshaped by the overall transformation that is taking place in the CFO role but also by energy transformation, which is shifting the technological, market and customer context for companies in the sector.

Energy Transformation Challenges

Energy transformation is forcing power company CFOs to take a more strategic view in addressing business challenges with consequences for the nature of their role. Many power utility companies are now operating in conditions where the traditional core revenue stream is much more uncertain. For the first time ever, the potential for a power utility company's business model to become eclipsed and left stranded is a real one.

Energy transformation is forcing CFOs to take a more strategic view in addressing business challenges. Specific Challenges include: Anticipating and leveraging the impact of new technologies; reassessing and restructuring the asset portfolio to optimize value; designing new ventures and commercial arrangements; achieving full recovery of prior investments; influencing policymakers and regulators; replacing declining revenues from traditional businesses; measuring enterprise performance as business models shift; and attracting capital through appropriate risk allocation. The degree to which each challenge applies depends on jurisdictional variations

1. Anticipating and Leveraging the Impact of New Technologies

The acceleration of technologies such as digitalisation, combined with the expansion of the breadth of the 'internet of things', is creating new opportunities for utilities. Barriers to entry are being broken down and new entrants are taking up positions in the sector.

Internet-connected home devices of all types, premises-based distributed generation and higher-efficiency storage enable business-to-consumer and business-to-business relationships and have the potential to realign elements of the traditional energy value chain through the creation of new value networks.

Data directly from the proliferation of discrete generation and consumption points may become a commodity that can be monetized by new market entrants through new products and services, as well as enhanced grid 'value'. Utilities need to assert their role in these new value networks to reduce the risk of losing revenue, market share or the ability to build new sources of margin.

Information technology has enabled transformation in every industry and flattened traditional hurdles to new entrants.

The effects of technology pose both an opportunity and a threat to utilities. It can help utilities meet demand loads while limiting capital commitments on generation through net-metering of the contribution from distributed generation and supporting smarter utilization of energy when it is necessary to be consumed. The same 'beyond-the-meter' technology also enables new market entrants to disintermediate certain customer loads from their traditional utility providers and to do so without costly infrastructural investments.

Challenges for the CFO to address usually include: Assessing and quantifying the business risk associated with the adoption of new technologies and making the right technology bets; utilising new technologies to create or enhance revenue streams; managing the costs of implementation and maturation, with good risk mitigation plans; advising on appropriate risk/reward incentives for new forms of technology partnerships; positioning communications with financial stakeholders as the business embraces technology; ensuring the business has effective cybersecurity protection in place and has robust business contingency, and recovery arrangements that will allow it to withstand cyber attacks.

2. Reassessing and Restructuring the Asset Portfolio to Optimize Value

Regulatory policies, financial pressures and market outlooks are forcing utilities to look both at the appropriateness of their corporate structures and the parts of the value chain where they wish to participate.

As energy transformation expands, the need to introduce responsive capabilities increases and the need for new assets, delivery systems and execution processes lead to the reassessment of the capability to succeed in current business areas or to optimise the value potential of the portfolio.

Companies are being forced to make a choice - do I 'hold or harvest' certain assets or businesses? Companies will need to place greater emphasis on understanding business and financial risks and managing portfolios to optimize value.

Challenges for the CFO to address here include: The benefits of restructuring or 'carve out' of segments of the business to reflect new strategic goals and value optimisation; optimising the financial viability of any 'carve outs' from the core business; developing investment propositions with a risk profile that will attract new capital; alternative approaches to investment financing in an environment of more competitive markets; and the need to reassess the structure of transfer pricing agreements between different parts of the business.

3. Designing New Ventures and Commercial Arrangements

The new business models we are seeing require new business partners, new skills and competencies and different kinds of commercial relationships.

The digital revolution is leading to customer access innovation at the same time that technology performance innovation is leading to grid parity across renewables. This trend is set to continue across both the technologies and solutions that will be offered to customers along the energy value chain.

If utilities are to maximize the opportunities arising from technology, they need to take a different strategic approach. The challenge is to determine which technologies to support, the type of services to offer to consumers and how best to harness the skills and competencies required to move from strategy to market delivery.

We see first movers appreciating the need to learn from the experiences of other industries, by entering into strategic partnerships and recognizing that the traditional self-contained utility mindset can actually constrain innovation.

Challenges for the CFO to address here include: Achieving congruence in partner strategy from the early stages

of any formal relationship by aligning interests and appropriate sharing of costs, risks and rewards; maintaining adequate control of investments while giving leeway to business partners to enhance value; management and optimization of a portfolio of business relationships with non-utility partners; gaining comfort on the ability to risk assess new ventures – especially technical risk and optimism bias, and putting in place appropriate mitigation measures; in addition to the development of the right exit strategies when necessary to preserve value.

4. Achieving Full Recovery of Prior Investments

In many markets, serviceable generation assets are being retired early. In Europe, this is driven by environmental subsidies and public policy initiatives; in the US expansive gas supplies, market structures and environmental policies; in developing countries, because of inadequate rates and non-payment.

Electricity markets have become less stable. Merit order dispatch has changed as a result of low carbon policies such as the introduction and removal of feed-in tariffs for renewable energy, relative fuel prices (gas vs. coal), market intervention such as capacity markets, the impact of technology on fuel prices (e.g. shale gas) and increasing levels of distributed and micro generation. With little prospect of change in the medium term, some thermal and renewable generators have found themselves unable to compete. The need to maintain shareholder returns has led to unexpected decisions being taken with impacts occurring in cost recognition, cost recovery and asset reinvestment.

Challenges for the CFO to address here include: Whether, how and when to take capital write-downs given broader strategic and financial imperatives; understanding the value of the asset portfolio to drive rebalancing decisions and mitigate the impact of stranded assets; adjusting long-term capital spending plans to take account of uncertainties in supply sufficiency and demand projections; determining which new investments can achieve financing that will support maintenance of the utility's target credit rating; and dealing with liabilities linked to specific assets in the portfolio.

5. Influencing Policy Makers and Regulators

Balancing the energy trilemma of affordability, security of supply and decarbonisation is resulting in increased regulation and scrutiny from policy makers, leading to increased uncertainty for utilities and an unwillingness to make significant investments without support. Renewable portfolio standards and smart grid mandates are increasingly driving investment priorities. Utilities are under pressure from energy efficiency standards which reduce energy revenues, depress demand for new generation and can lead to excess network capacity.

Regulatory regimes are having a more intense effect on the nature of investments, including delaying expansion and replacement decisions. Increased regulatory scrutiny is necessitating additional reporting and data gathering, affecting processes, systems, staff and operating efficiency.

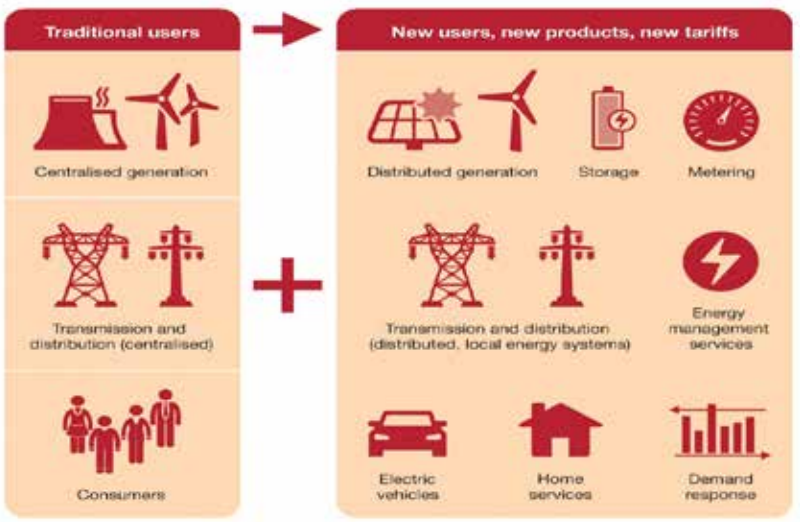
Challenges for the CFO to address include: developing investment and financial management strategies that recognise regulatory and policy uncertainties and their impact on the business; adapting the financial management of the business in response to regulatory obligations such as mandates for unbundling, smart grid or renewable programes; devising new regulatory mandates to address changes in current markets related to transformation; defining the right future policies to address 'second stage' effects from poor policy design; determining and defending the rate case or regulatory submission to regulators to incorporate the operational implications of technology, and transformational change.

6. Replacing Declining Revenues from Traditional Businesses

Distributed generation and new technology threaten traditional utility business models. Customers can now self-supply, bypassing utility infrastructure and installing more inventive consumption tools, and challenging the role of utilities.

Traditional network utility business plans are based on regulated returns from long-lived assets. As technology leads to more decentralisation, the network businesses need to raise the same level of revenues from a smaller number of customers and reduced volume throughput. The necessary solutions will be guided by both strategic and regulatory solutions. To avoid a continuous decline, the utility sector needs to look at both how to deliver traditional services efficiently, but more importantly create the ability to backfill revenue erosion. This demands more innovation.

Challenges for the CFO to address include: Predicting, measuring and managing the impact of customer load reduction on revenues; defining the options and potential for new revenue creation and capture; design of alternative cost-recovery approaches given the decline in volume and level of potential unrecoverable costs; identification and development of other services that could be offered to replace lost revenues; in addition to the appropriateness of different business models to be considered for network ownership or operation to enhance derived value.



7. Measuring Enterprise Performance as Business Models Shift

Changes to business models are driving new relationships with customers and suppliers in the energy value chain and putting additional pressure on the management of business performance in a more demanding market and investment environment. Changing business models exacerbate the stress to produce requisite financial results.

Customer behaviours are changing and they expect more information faster, increased transparency and digitisation, seeking higher value from their discretionary spend. Companies will need to find the right balance between pursuing aggressive strategic goals and ensuring that core operational performance is not only sustained, but also enhanced.

Challenges for the CFO to address include: Ensuring the execution models utilised by the company are aligned with the financial needs of the business; making sure that finance performs the role of an agile business partner to the operations and commercial parts of the business; ensuring that the KPIs monitored are effective at demonstrating quality outcomes against strategic objectives, balancing consistency, quality and efficiency; implementing a culture of continuous improvement and efficient change management; and developing a model for measurement of business performance that extends beyond common financial, operational metrics.

8. Attracting Capital Through Appropriate Risk Allocation

The energy sector competes for scarce global capital with large infrastructure projects, regulated businesses and cross-industry retail investment opportunities. The unprecedented volatility and uncertainty in the energy sector is changing investor risk perception, placing additional pressure on utility balance sheets.

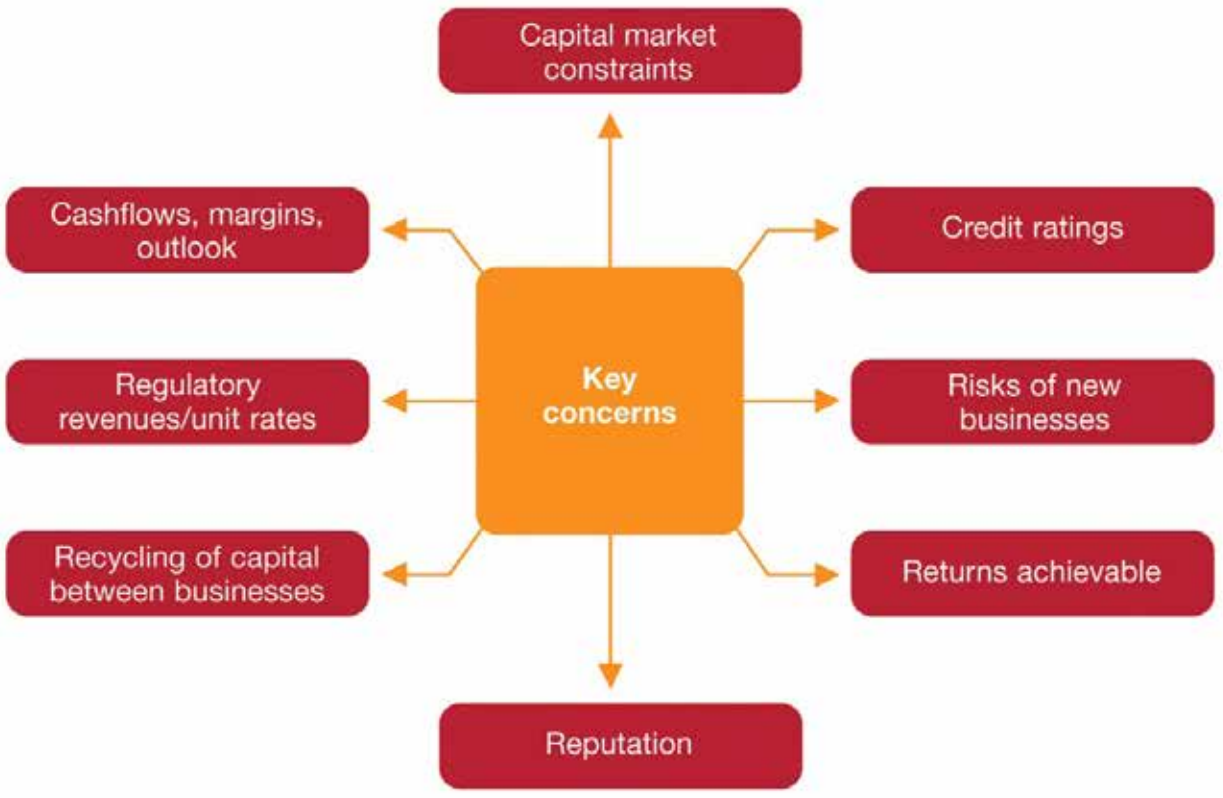
Attracting capital has always been a challenge, but the disruption caused by energy transformation has added a new dimension to the challenge for utilities. As the structure of the market changes and becomes less stable, both in the competitive and regulated sectors, the choices of where to allocate scarce capital become more complex. Investors have a vast array of infrastructure projects in which to place their capital and the advent of smart grids, renewable technology and beyond-the-meter services increases the risk profile above that of a traditional utility.

Companies need to balance the longer-term capital replacement requirements associated with traditional business models with the shorter-term capital

return horizons that align with the new market fundamentals of the market.

Risk allocation to the party best able to manage the risk becomes ever more important in attracting investment.

Challenges for the CFO to address here include: Prioritisation of capital investment levels and timing to optimise financial outcomes; understanding the differences in risks related to capital projects across the company value chain; development of risk-adjusted returns to reflect the true level of risks associated with individual capital projects; management of capital deployment performance in a manner consistent with internal risks assumed; adoption of more stringent project evaluation business case methodologies to ensure optimisation of scarce resources; In addition to ensuring appropriate risk allocation and return on investment to attract financial investors for major projects.



The PwC CFO Checklist Identifies 10 Key Questions to Address

1. Does the board have a clear view of the answers to the questions that need to shape your focus as a CFO – 'where to play' strategically, 'how to play' commercially and 'how to win' competitively?

2. Are the requirements of the transformation being matched with the capabilities to analyze value and to differentiate activities that create clear market positioning value from those that merely draw resources and do not advance the strategic agenda of the company?

3. Have you got the necessary tools and insights to judge the best financing and corporate restructuring options to deliver on the chosen future strategy?

4. Do you have the right forward- and outward-facing data gathering and analysis capabilities in place that can turn data into insight and, more importantly, insight into foresight?

5. Is your reporting keeping pace? Are you able to align and communicate about the energy industry transformation that is taking place with a clear and convincing value realization strategy – upwards at the board, outwards to investors, policymakers, regulators, customers and the public, and downwards through the organization?

6. Do you know what impact different incubation, collaboration and partnering structures might have on value and on your options for venturing into new areas?

7. Have you got processes in place that enable comparison of capital deployment options right across the business, not just within particular business units, so that capital allocation can be truly matched to the enterprise's strategic outcomes?

8. Do you have effective processes that enable alignment of the critical functions necessary to support quality financial stewardship and a distinctive strategic architecture?

9. Are you gathering the evidence and insight that will enable you to have a proactive dialogue with policymakers and the regulator to ensure that the regulatory roadmap around energy transformation does not lead to unintended consequences?

10. Do you have flexible risk allocation and mitigation strategies in place to enable the company to manage the impacts of energy transformation?

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PwC Director- Head of Oil & Gas

BASMA SAMRA
PwC Partner- Utility, Mining & Energy Leader

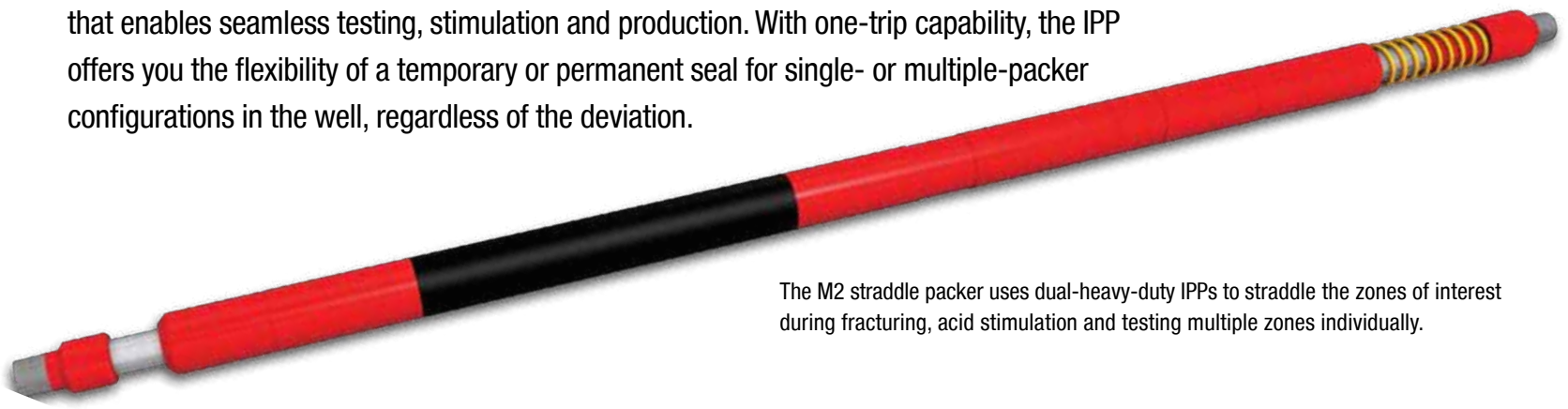
WAEL SAKR
PwC Partner-Assurance Leader

HISHAM OWIS
PwC Director, Industry Expert

Zonal Isolation for Drilling and Completions

Reduce rig time with versatile inflatable-packer technology

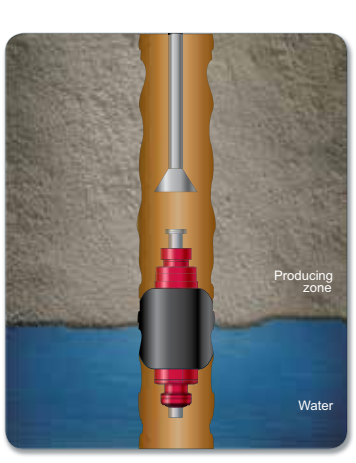
Weatherford's inflatable production packer (IPP) provides a versatile workover isolation system that enables seamless testing, stimulation and production. With one-trip capability, the IPP offers you the flexibility of a temporary or permanent seal for single- or multiple-packer configurations in the well, regardless of the deviation.

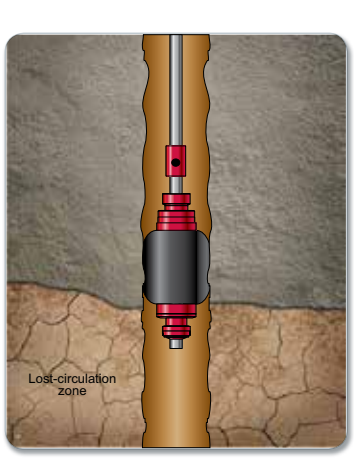


The M2 straddle packer uses dual-heavy-duty IPPs to straddle the zones of interest during fracturing, acid stimulation and testing multiple zones individually.

IPP Advantages

- Slim run-in OD allows for drifting through existing restrictions
- Largest available hole-setting capability
- Ability to test below or between elements
- Multiple sets in one trip
- Cased-hole and openhole capabilities





IPP Applications

- Cement retainer
- Casing-integrity testing
- Testing of casing patches (above or below)
- Permanent bridge plug
- Water shutoff
- Scab liner
- Openhole testing and stimulation
- Selective production testing of particular zones

Weatherford®

Alamein's Horus Field Development Plan

The project's purpose is to increase Horus field production by 150% in fiscal year 2015/2016, upgrade field production facilities, and upgrade accommodation facilities.

Horus Development Area, Western Desert, A.R.E. is located in the Northern part of the Egyptian territories almost 25 Km south of the Mediterranean sea, surrounded by oil fields such as Burg al Arab onshore from the northeast side, as well as Alamein, Yidma and Razzak oil fields from the west and southwest.

Horus classifies as a mature field, consisting of 2 main producing reservoirs Abu Rawash G dolomite and Bahariya. The field has been producing since 1986 and is in the tail end of its production life with a cumulative production of some 11.5 MMstb with a current production rate of almost 1000 b/d. Horus Development Area was issued by law no 205/2014 on July 8th 2015 to Tharwa, Operator (60%) and GPC (40%) for ten years. Exploitation and development are subject to be extended for another period(s). The financial commitment during the 10 years is to spend at least $18.5m to develop the said area.

Interim study has been done for the following objectives

- Assess the first scenario to develop Abu Rawash G dolomite and Baharyia in Horus area by infill drilling in first five years, two wells a year which will be contingent to the results of drilling in the first year. A budget for 2 wells has already been allocated for fiscal year 2015-2016.
- Assess and study to acquire new 3D seismic survey for the deep horizons; AEL and Jurassic to scope of adding reserve.
- Assess and study water injection project to support pressure in Abu Rawash G dolomite and increase the ultimate recovery. The attached production forecast does not reflect the effect of water flooding, since its impact is not sure yet to increase the ultimate recovery.
- Also, the upside potential of exploration activities are not considered in the forecast, since the results are not firm yet and it will enhance the economic indicators in case of successful exploration drilling results.
- Contractor jointly with El Alamein agreed in principle on the first development well location Horus-15, and its technical documents are ready in addition the related service and material contract using farm out are also ready to acquire EGPC approvals. The following text in this report shows detailed well prognosis for Horus-15, as well as summary for new wells Horus-16 and Horus-17.
- The current study is based on a conservative consideration of parameters. In order to see the limits of the economic indicators, several sensitivities were carried out taking into consideration the projected low oil price in the next years (assumed $60 per bbl).
- On the prospective of EGPC cash flow profile, its expected revenue will range between 15m to 20m a year, starting 2015 until 2025. The expected cumulative EGPC cash flow from 2015 to 2025 is around $187m based on $60/bbl for oil price.

The Surface Facility Summary (SFS)

Horus was designed as an oil facility, commissioned in early 1985 and it is still operating today. The Horus field infrastructure has mostly exceeded its life time and it needs to be maintained, replaced, overhauled to avoid any production discontinuance and also to comply with HSE standards and regulations.

The available infrastructure can be summarized as follows:

- Wells: guarantee for opportunities of increasing production after subsurface studies concluded a promising potential, such potential identified the need of water injection and artificial lift for most of the new development.
- Tanks.
- Separators: Such proposal is expected to increase the Horus oil reserves resulting in an unconstrained peak.
- Shipping pumps.
- Generators.
- Accommodation facilities.
- A/L systems.

Horus Field Development Plan and Firm Commitment

The Surface Facility Upgrading Plan (SFUP):

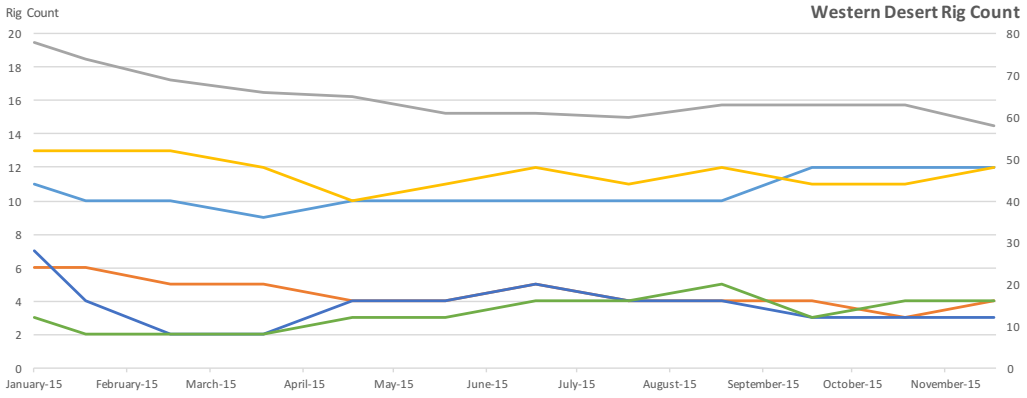
- Firefighting System repair (FFSR).
- Generators overhauling maintenance.
- Fix and maintain production/shipping tank.
- Fix/upgrade accommodation camp units.
- Fix separators, piping and junctions.
- Upgrade the existing fence around production facilities.
- Upgrade accommodation facilities.
- Extend food court.
- Sucker rod workshop completion.
- Convert the area of old water pit to a place complied with the Egyptian environmental rules and regulations and replace it with new compiled one.

Horus Field Development Plan and Firm Commitment

Development Drilling (DD):

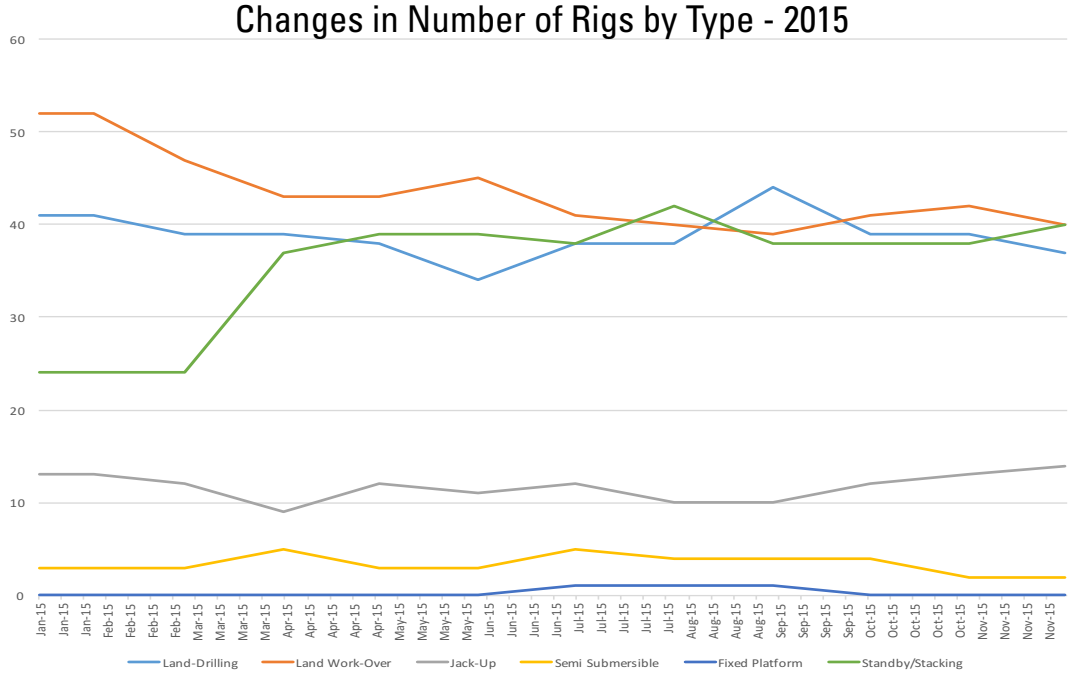
In compliance with the agreement, the contractor is to present a development plan for one year or more, and in addition to the above mentioned Surface Facility Upgrading Plan (SFUP), the contractor shall allocate budget to drill one firm development well Horus-15, and one contingent well Horus-16, dependent on the results of the firm well. The financial commitment shall be completed by spending $18.5m. In order to expedite drilling APC already started to farm in the related contracts from sister companies and drilling shall be started right after securing material and contracts.

Changes in Number of Rigs by Location - 2015

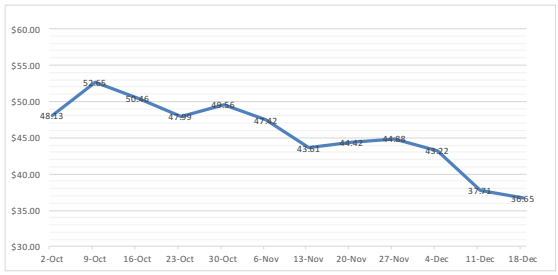


	January-15	February-15	March-15	April-15	May-15	June-15	July-15	August-15	September-15	October-15	November-15	December-15
G.O.S.	11	10	10	9	10	10	10	10	10	12	12	12
Med. Sea	6	6	5	5	4	4	5	4	4	4	3	4
Sinai	13	13	13	12	10	11	12	11	12	11	11	12
E.D.	7	4	2	2	4	4	5	4	4	3	3	3
Delta	3	2	2	2	3	3	4	4	5	3	4	4
W.D.	78	74	69	66	65	61	61	60	63	63	63	58

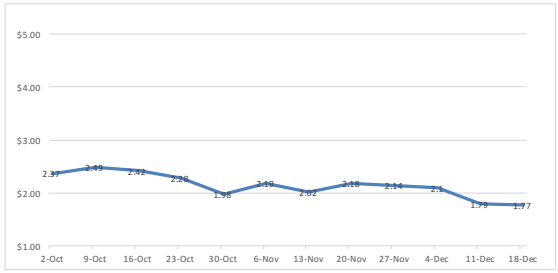
Changes in Number of Rigs by Type - 2015



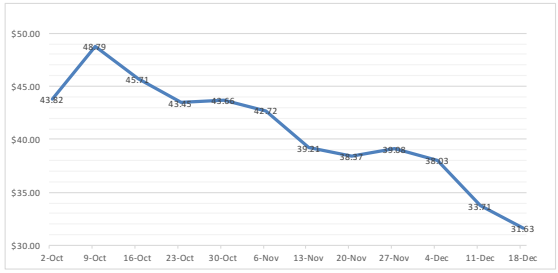
BRENT PRICE



NATURAL GAS



OPEC BASKET PRICE

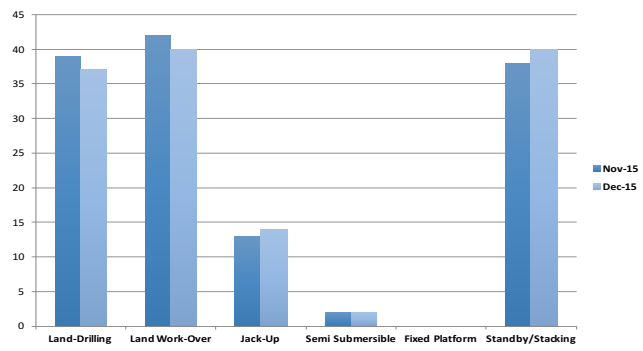


Production November 2015

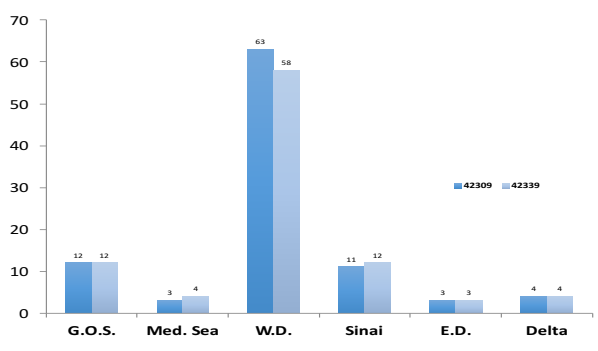
	Equivalent Gas	Condensate	Liquefied Gas
Med. Sea	11501607	689735	257888
E.D.	25179	1818	3762
W.D.	7661429	1577536	669427
GOS	603571	81192	250417
Delta	2404286	166301	104955
Sinai	3571	26702	52587
Total	22199643	2543284	1339036

Unit: Barrel

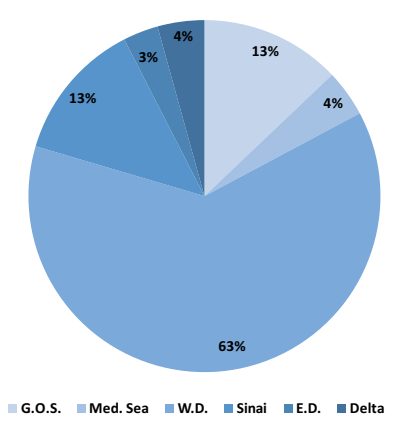
Rigs per Specification - November - December 2015



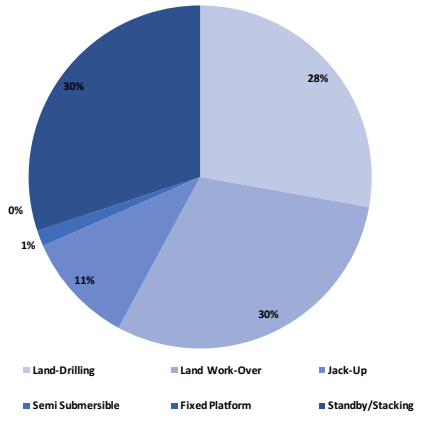
Rigs per Area - November-December 2015



Rigs per Area - December 2015



Rigs per Specification - December 2015



Rigs per Specification Nov-Dec 2015

Location	Nov. 2015	Dec. 2015
Land-Drilling	39	37
Land Work-Over	42	40
Jack-Up	13	14
Semi Submersible	2	2
Standby/Stacking	38	40
Total	134	133

Working Rigs Per Area Nov-Dec 2015

Location	Nov. 2015	Dec. 2015
G.O.S.	12	12
Med. Sea	3	4
W.D.	63	58
Sinai	11	12
E.D.	3	3
Delta	4	4
Total	96	93

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