



**Policy Options and Prospects
for Egypt's Downstream Sector**

Across the Technological Horizon:
**R&D Solutions for Egypt's
Downstream Sector**

**Optimizing Egypt's Fuel
Distribution Scheme**

Parallel Paths:
Energy Reform in Egypt and Jordan



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Published by

EGYPT
OIL&GAS
NEWSPAPER

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- EOR in naturally fractured reservoirs
- EOR in non-fractured reservoirs
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- Prediction of water flood performance
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CASE STUDIES

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- Smart water

OPERATING WATER FLOOD

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- Reservoir souring mechanisms, corrective actions and mitigation measures
- Performance evaluation within multi-flow unit formation
- Management of IVRRs

ABSTRACT CONTENT

Description of the proposed presentation summarizing the scope of business upon which the presentation will be based.

PRESENTATION CONDITIONS:

- Must be technically correct, related to EOR or Water Flooding
- Should avoid commercialization
- Must be written in English
- Should be submitted in electronic format and be a maximum of 500 words

DEADLINES FOR ABSTRACTS:

March 1, 2016 – Abstract submission
March 15, 2016 – Notification of acceptance
April 15, 2016 – Presentation submission

SEND YOUR ABSTRACT TO:

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EDITOR'S NOTE

Like its nature, working on the downstream sector this month proved challenging, not due to the lack of information, but rather the overwhelming and conflicting data. Many of the experts we interviewed for this issue stressed the fact that the key to solving Egypt's energy challenges begin with the downstream sector. That's why Egypt Oil & Gas focused this month on the government's largest plan to attack fuel smuggling, the smart card system, providing an overview of the current situation, the challenges, and the shortcomings.

The closer you are to the end consumer, the more downstream you get. This issue has been designed to cover the sector from refineries down to industrial and end consumers.

A major challenge Egypt is currently suffering from when it comes to the downstream sector is the gap between the universities and the needs of the downstream sector. Very few curricula in Egypt's universities prepare graduates for the needs of the downstream sector; not only that but the research and development activities at most Egyptian universities have been giving a blind eye to this part of the sector. Egypt Oil & Gas addresses this issue with an analysis piece on the topic.

Moving on to the industrial sector, where energy supply is currently their biggest obstacle. This issue includes an overview of the two main dilemmas energy intensive factories are suffering from: volatile energy feedstock, and shortage in foreign currency, which in part is due to energy imports.

Focusing on the downstream sector did not stop us from having a more aggregate view of Egypt's economy, as well as that of neighboring countries. We had the pleasure of interviewing this month the former Minister of Energy for Jordan, who discussed the significant similarities between Egypt's current challenges and Jordan's previous ones.

On behalf of Egypt Oil & Gas editorial team, thank you for your readership, and we hope you enjoy this issue.

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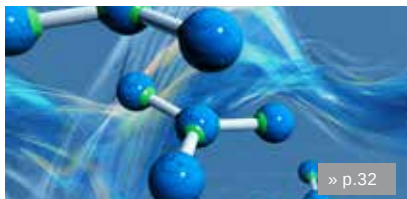
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El Molla: Egypt “Suffering” from Subsidies



Egyptian Petroleum Minister, Tarek El Molla, said that Egypt is “suffering” from fuel subsidies and that funding for subsidies is better spent on other areas, such as health and education. According to the minister in a report by Reuters, this was the first time he discussed the topic of subsidy disadvantages publicly. The minister said that between July and September 2015, the Egyptian government covered 42% of the cost of 92-octane gasoline, which is used in most vehicles in Egypt. During that time frame, a liter of 92-octane gasoline cost the government EGP4.5, while the cost at the pump was EGP2.6. However, Egypt has benefitted from low global energy prices. Egypt's budget for fuel subsidies has decreased by EGP 5b, reaching EGP 56b,

in comparison to initial estimates of EGP 61b. Egypt spent EGP 14b on petroleum subsidies in Q1 2015/2016 fiscal year, in comparison to EGP 18b of the same period in 2014/2015. Beginning in the summer of 2014, the government has started cutting subsidies heavily for fuel, although low prices have rolled back plans for full elimination. Reports this month said that butane subsidies for upper-class citizens would be eliminated within the next three years. The costs of gasoline and electricity have increased substantially over the last year as well. The government has aimed to implement a “smart card” system to better regulate subsidies, but the effort has been postponed for months. Khaled Abdul

Ghani, the project director for the system, told Egypt Oil & Gas that 50,000 new subscribers were registered prior to the actual application of fuel stations in the governorates, scheduled for May, in line with the government plan to insure that subsidized fuel reaches those eligible, the low-income groups. Abdul Ghani clarified that the smart card system is ready to be universalized with the second phase for subsidized gasoline and diesel distribution to citizens at fuel stations nationwide, after recording 6.2m citizens who are in fact eligible. With the implementation of the second phase will put an end to the fuel crises once and for all and counter black market dealers, he said.

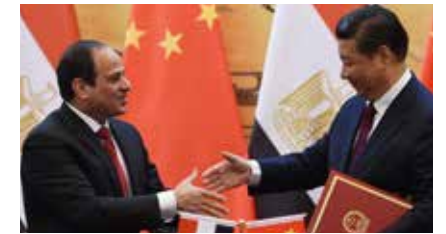
Egypt, Saudi Arabia Discuss Investment

The Egyptian government and Saudi Arabia discussed investment, loans and aid in January. Egypt presented proposals and feasibility studies for projects in the energy, housing, agriculture, and tourism sectors to the Saudi Arabian government early in the month, Daily News Egypt reports.

The bilateral meetings in Riyadh aimed to discuss how the \$8b in investment funding offered by King Salman would be spent over the next 5 years. Egyptian Minister of International Cooperation, Sahar Nasr urged Saudi Arabia to hasten investment, which the Saudis have said they aim to do, and to help meet Egypt's energy investment and petroleum derivatives needs for the pledged period of time. Egyptian Minister of Investment, Ashraf Salman, stated that the next steps would be providing the necessary permits for projects agreed to and conducting the market research necessary for further projects. In the meetings, Egypt agreed to borrow \$1.2b to support oil purchases over the first three months of 2016 and additional \$1.5b for development in the Sinai Peninsula. The Sinai development funds match another \$1.5b for the same purpose that was provided by the Kuwait Fund for Development, the Abu Dhabi Fund, the Arab Fund for Economic and Social Development, and the Islamic Development Fund.



Egypt, China to Sign Six Electricity Infrastructure Deals



The Egyptian Ministry of Electricity signed six new agreements for Chinese investment in Egypt's electricity infrastructure projects during Chinese President, Xi Jinping's visit to Cairo in January, Amwal Al Ghad reports.

According to Electricity Minister, Mohamed Shaker, the ministry expects to sign the deals with the China Export and Credit Insurance Corporation (Sinosure) and the Export-Import Bank of China. President Jinping will also attend the signing of the final contracts for projects in the new administrative capital with the Arab Contractors Company, the Petroleum Projects & Technical Consultations Co. (Petrojet) and the China State Construction Engineering Corporation (CSCES).

Chinese and Egyptian Presidents will also discuss regional matters and bilateral cooperation between Beijing and Cairo. The visit is a part of China's President's tour in the Middle East region, the first in more than ten years.

Petroleum Ministry: Payments Being Made on Time

The petroleum sector has been able to fulfill its financial obligations in business dealings on a regular basis, Ministry of Petroleum spokesman Hamdi Abdel Aziz said. The statement was meant to dispel stories about delays in payments owed to international companies for the value of contracted LNG shipments. He clarified that since the start of LNG imports in April, until the end of December, 54 shipments valued at \$4.1b have been paid for, adding that between 6-8 shipments are imported monthly.



Zohr: The Whole Picture

In August 2015, Italy's Eni announced a mega gas find in Egypt's Mediterranean area, specifically in Zohr field in the Shorouk concession. Data showed that Zohr contains 30 tcf of gas reserves, in addition to 5.5 bboe.

Khalid Abd Al Badie, Chairman of the Egyptian Natural Gas Holding Company (EGAS) stated in September 2015 that EGAS and Eni had formed a joint working group to review the development plan for Shorouk. This move was part of the ministry's efforts to encourage the speeding up of production to meet the country's growing energy demand. EGAS' negotiations with Eni also focused on expediting the construction of the infrastructure that would link Zohr to the country's national gas grid.

Lapo Pistelli, Vice President of Eni, announced in October that development operations would begin in Zohr in January 2016. A statement that was followed with the petroleum ministry's announcement that it reached an agreement with Eni ensuring that Zohr produces 1 bcf/d in 2017.

A plan for the rapid development of the field had been devised stretching over two years, with production starting before the end of 2017, with maximum production to be reached in 2019. Drilling at Zohr began in December 2015, at an initial investment of \$12b.

In November 2015, Mohamed Al Masry, Chairman of EGPC, stated that he expected between 22 tcf and 26 tcf of gas to be extracted from Zohr, which is perhaps the largest amount to be extracted from a Mediterranean field to date.

The agreement between Eni and Egypt states that the price for gas produced will be linked to an equation with a minimum price of \$4 per mmbtu and a maximum of \$5.88 per mmbtu. The agreement, which will be renegotiated in 2019, requires all gas to go to the Egyptian domestic market, allowing exports only for excess gas.

The Shorouk concession agreement signed between Eni and the Egyptian government calls for 40% of revenues to go to-



wards recovering the investment in the fields. Eni's repayment value will cover its \$7b investments in Zohr over three years. The remaining revenues will be split between Egypt, which will receive 65%, and Eni, which will receive 35%. Meanwhile, Egypt will offer an international bid round for new oil and gas exploration blocks in the Mediterranean and Nile Delta, according to EGAS Abdel Badie. The tender will be held in the second half of the 2015/2016 fiscal year. Abdel Badie also said the EGAS will sign three new contracts for Mediterranean Sea development worth \$500m. The news comes weeks after the EGPC postponed a bid round scheduled for early 2016 due to low energy prices.

Egypt has been working to attract exploration and investment despite increasing arrears, now at \$3b. The chairman added that around 760 mcf/d of new gas production will have come online in FY 2015-2016 thanks to new projects and development wells.

Local Stability of Dollar Saves Egypt 250m a Month



The stability of the local exchange rate for the US Dollar, will save the Egyptian government an estimated EGP 250m per month; a positive reduction that coincides with the low current Brent price of \$23 (on Thursday 21/1), an EGPC official told Egypt Oil & Gas.

He explained that Egypt's current import deals with fuel exporters stipulates that payments for fuel shipments be made within 45 days of receiving the cargo at Egyptian ports. This is especially in light of the fact that the suppliers refuse to be paid in EGP.

The source added that the coming period would witness many new petroleum agreements signed with foreign partners, pushing up crude oil and natural gas production rates. Measures would be taken to facilitate huge investments for drilling operations. Egypt is aiming for \$8.5b worth of investment during 2016. It is worth noting that Egypt has to pay a 1% interest rate a year in US dollars in the event of late payment to fuel suppliers for the value of shipments.

El Molla Offers Outlook for 2016



Egyptian Petroleum Minister, Tarek El Molla, stated that high production and slowing global demand were likely to keep energy prices low through 2017, making cooperation and coordination between states important, the Minister said in an interview with the Khaleej Times.

He said that diversification, wise management of natural and financial resources, and learning from previous global oil crises have minimized the negative impacts of low prices for the region's major producers. In forecasting 2016, El Molla also stated that this year Egypt would introduce three international bids for oil and gas exploration, 25 new agreements worth \$5.4b, the start of production at eight projects in gas field development worth \$2.1b producing at a daily rate of 450mcf, and beginning of operation of two new projects in the fields of fertilizers and petrochemicals at over \$3b worth of

investments.

El Molla stated that Egypt currently imported 50% of its butane needs, 30% of its diesel needs and 15% of its gasoline – imports, which have been less expensive with lower global prices. In 2016, the country hopes to increase production of crude oil and condensates to reach 700,000 b/d – 15,000 more barrels than last year. "We also aim at increasing natural gas production to reach 4.7b b/d, which is 400m more barrels than the current production," he added. El Molla's outlook for 2017 in Egypt is promising, with a number of new fields coming online. El Molla estimates that the North Alexandria project will produce at a daily production rate of 700mcf, and the Shorouk Gas project at a daily production rate of 900mcf. Egypt is currently forced to import 1bcf/d of LNG, an expensive endeavor.



Egypt's Electricity Infrastructure Receiving Investment



Egypt's power plants and electricity infrastructure received much attention in January. Egypt announced the allocation of EGP 3.82b for the laying of distribution lines, building of transformers, and cables of medium and low voltage, plans that are expected to take effect this year, according to Daily News Egypt.

The plan includes an investment of EGP 24.8m for building 79 medium-voltage dispensers, EGP 234.9b for the building of a 1,375km long medium voltage network lines and EGP 1.2b for 3,498km long cables, EGP 350m for the expansion of low-voltage grid by 3,504km long of lines, EGP 272m for the laying of 2,271km long cables. In addition, the EEHC also intends to contract for 1,036 distribution transformers, 9,120 capacity distribution transformers with a total value of EGP 1.6bn, and 6,347 low voltage transformers. The move comes as a part of the Ministry of Electricity's plan to improve efficiency of the country's infrastructure, saving fuel consumption. Later, a coalition of banks led by the National Bank of Egypt (NBE) is offering Egypt's state-run Egyptian Electricity Transmission Company (EETC) financing worth EGP 7b (\$894m) to be repaid over

15 years.

Vice President of the National Bank of Egypt, Mahmoud Montasser, had also said that NBE has provided loans worth EGP 12.6b for the country's electricity sector over the past five years. The bank has been the sole financier of electricity projects in Abu Qir and Benha worth around EGP 2.4b and has supported electricity transmission networks and maintenance work for EETC stations. Later in the month, the Egyptian Ministry of Electricity received Chinese President, Xi Jinping where six new agreements for Chinese investment in Egypt's electricity infrastructure projects were discussed, according to Al Mal News.

Sheikh Zayed City Development Authority also announced that it is in the process of launching a 500 MW power plant, with investments worth EGP 200m (\$25.5m). The plant is set to be implemented on two phases, each phase will generate 250 MW. Further, Orascom Construction announced signing agreements to convert Egypt's Assiut and West Damietta power plants from simple to combined cycle, an endeavor that is worth \$420m.

EU Eyes Gas Imports from East Mediterranean

The European Union could import gas from newly discovered deposits in the Eastern Mediterranean in an attempt to diversify its supplies and bolster Europe's energy security, EU Energy Commissioner, Maros Sefcovic, said during his Energy Union Tour's visit to Cyprus, ABC reports.

Sefcovic added that the Eastern Mediterranean may become a key player in the energy supplies to Europe. The commissioner stated that the Zohr gas field discovered offshore Egypt is estimated to hold gas deposits that would meet Europe's annual energy needs of 400-500bcm for up to eight years. He stressed that gas shipments from the field to Europe might be launched first after energy needs of countries in the region are satisfied. The EU Commission will present a new LNG strategy for Europe in February, considering the Mediterranean as

an important gateway for the new supplies for Europe. In line with the EU's foreign policy in the energy domain, Brussels is to provide funding for three Cypriot projects including the Euro Asia Interconnector, a cable linking up the electricity grids of Cyprus, Israel, and Greece, the EastMed pipeline, a project for the linking of the Eastern Mediterranean natural gas fields between Cyprus and Greece, and the removing of the internal barriers with a view to end Cyprus' energy isolation.



Egypt Air's Debt to EGPC Escalates to EGP 7b

Egypt Air's dues to EGPC have expanded to reach EGP 7b, rising from EGP 5.5b in under six months. Egypt Air has stopped paying for the fuel, which leads to the escalation of their debt, said an official at EGPC. This is in addition to monthly premiums it owes for old debts. He added that Egypt Air stopped paying off its EGP 25m monthly installments, while the company consumes fuel worth between EGP 450 and 500m a month. Egypt Air has been suffering financially since the January 2011 revolution and with the

latest bows to tourism the company's cumulative losses have reached EGP 10b by the end of 2015. Currently, only 71 of its fleet of 81 aircraft are still operating. If these adverse political circumstances continue the fear is that the airline's plans to reduce its losses to zero by the end of the fiscal year will come undone, having already reduced its losses to EGP 718m from the original figure of EGP 3b the previous fiscal year.

Kuwait Offers Loan for Electricity Infrastructure

The Kuwait Fund for Arab Economic Development (KFAED) and Egypt finalized an agreement for a \$99m (KWD 30m) loan for Egypt. The loan will be directed towards funding a project that will expand Egypt's electricity grid, linking it to Saudi Arabia. The electricity linkage project targets to exchange around 3,000 MW of electricity during peak hours to meet the country's electricity demand.

The project is based on linking the two grids from Badr substation in Egypt to East Medina substation in Saudi Arabia, passing through the Tabuk substation in Saudi Arabia. The project covers 1,300 km with a capacity of 3,000 MW to link the two largest electricity systems in the Arab world, which have a total capacity of 90,000 MW.

Egypt's Crude Oil Imports Drop 68% in September

Egypt's Central Agency for Public Mobilization and Statistics (CAPMAS), the state statistics agency, reports that imports of 10 commodities dropped to \$2.1b, down by 29%, during September 2015, which is largely the result of reduced energy prices. The ten commodities represent 41.1% of Egypt's imports. In addition, a monthly report released by CAPMAS also states that crude oil imports dropped by 68% in September 2015 compared to September 2014 - from EGP2.4b to EGP780m. Egypt's total petroleum product imports dropped 15.8% in September 2015 to record low of EGP5.4b, down from EGP6.4b in the same month last year. Egypt's trade balance deficit has decreased by 22.1% in September 2015, compared to September 2014, according to CAPMAS' earlier reports cited by Daily News Egypt. This is largely due to decreasing costs of major imports, rather than major gains in



exports - the decline of which has placed pressure on Egypt's foreign currency reserves.

EGPC, ADNOC Negotiating Fuel Shipments and Payments

The EGPC is currently in negotiations with Abu Dhabi National Oil Company (ADNOC) for shipments of petroleum products and payment facilitations. An official said that the negotiations are to further secure Egypt's petroleum needs, with the help of Saudi Arabia, Kuwait, and the UAE. A deal will be in addition to a 5-year support agreement signed with Saudi Arabia last month. The previous contract between EGPC and ADNOC, which guaranteed the

supply of petroleum materials shipments to Egypt with payment facilities, ended in October 2015. EGPC previously entered into a \$9b agreement with ADNOC to supply petroleum materials to Egypt for a year, but the contract was suspended in January after only five months. The value of the shipments received during this the period was \$2bn. The official did not explain why negotiations have resumed.

Seven Investors Building Solar Cells in Egypt

There are now 7 companies building solar cell components in Egypt, according to New and Renewable Energy Authority Head, Dr. Mohamed Al Sobky. Sobky said that that solar cell assembly was taking place in multiple locations. He noted the high cost of solar cell construction, due to the high power supplies required to build solar cells and panels. He stated that the NREA was manufacturing 25% of components in new wind power projects locally. Demand and market size are

among the factors which affect whether components are made locally, Sobky said. Egypt is seeking to expand renewables at a fast rate, and has implemented a feed-in tariff system to encourage renewables investment. However, an obstacle has been government policies which limit dollar financing for energy projects - a problem for renewables companies which must import virtually all equipment from abroad.

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BP Aims to Double Gas Production in Egypt in 4 Years



BP aims to double natural gas production in Egypt in the next four years, despite weak prices. According to Reuters, the move would assist Egypt in its quest for rapid expansion of energy production in order to rebuild an economy that has struggled for years.

BP currently produces 10% of Egypt's oil production and 30% of Egypt's gas – around 1.4-1.5bcf/d of gas. According to BP North Africa Regional President, Hesham Mekawi, "BP's plan is to double our gas production in Egypt, before the end of this decade." He also explained that the Zohr discovery "gives a big incentive to the players who are here and maybe others considering investing in

Egypt to do more; it proves what BP has believed for many years – that the Nile Delta is a world-class gas basin."

The majority of additional production that BP will bring online in the next few years will come from its West Nile Delta project – expected to reach around 1.2 bcf/d starting in 2017. Further, the Atoll field in the Eastern Nile Delta, could bring 250 mcf/d online by end 2017. "(Atoll) is a very good example of how we're moving fast and our partnership in Egypt is very successful. We had a discovery, and based on our confidence in Egypt we decided to move forward quickly," said Mekawi.

Oil Investments Total \$7.5b for FY 2016/2017



Foreign energy companies investment in research, exploration and development in Egypt's oil sector in the next fiscal year amount to over \$7b, reports Daily News Egypt.

According to an official with the Ministry of Petroleum, foreign company investment in the sector increased to around \$7.5b in 2016 – more than the \$7b initially expected for the year. The Ministry of Petroleum expects the total investments in the fields of research, exploration, development, refinement, petrochemicals, infrastructure, pipeline extensions, and delivering natural gas to households to amount to \$16b during 2016.

The official said there are 108 joint companies operating in the petroleum sector and 62 research and exploration companies from different countries. The official stated that the broad array of firms reflects the strength of Egypt's

economic relations abroad and sends a message of confidence in the petroleum sector.

The Ministry of Petroleum has developed a set of priorities to strengthen the investment climate and build the confidence to foreign partners. The ministry aims to offer international bids and sign agreements worth \$4.5b and also expects to expand development and production projects through investments worth approximately \$1.2b. Plans for the coming year include linking eight oil projects to the national network for gas production and adding 250m cubic feet of gas per day through investments worth approximately \$1.2b. The goal is to have 19 wells producing 325 mcf of gas per day during 2016. The ministry also plans to bring natural gas production up to 4.5 bcf/d in 2016, up from 4.1b.

DRILLING

KHALDA

KHALDA, a joint venture company between EGPC and Apache, has completed drilling new oil and gas-development wells in its concession area in the Western Desert. The production rate of KHALDA was 4,699,192 barrels of oil and 4,507,459 barrels of equivalent as of December 2015.

BERENICE-4

The oil-development well was drilled at a depth of 11,535ft utilizing the EDC-40 rig. Investments surrounding the project are estimated to be \$1m.

HYDRA-10

The gas-development well was drilled at a depth of 13,700ft utilizing the EDC-16 rig. Investments surrounding the project are estimated to be \$1.786m.

WKAL T-5

The oil-development well was drilled at a depth of 15,200ft utilizing the EDC-40 rig. Investments surrounding the project are estimated to be \$2.200m.

QARUN

QARUN, a joint venture company between EGPC and Apache, has completed drilling new oil-development and exploration wells in its concession area in the Western Desert. The production rate of QARUN was 1,124,293 barrels of oil as of December 2015.

WON C-202

The new development well was drilled at a depth of 7,282ft utilizing the EDC-47 rig. Investments surrounding the project are estimated to be \$850,000. It is worth noting that the well is being placed on production.

WON C-N-1X

The new exploration well was drilled at a depth of 11,715ft utilizing the EDC-63 rig. Investments surrounding the project are estimated to be \$2.365m. It is worth noting that the well is being placed on production.

WON X-3

The new development well was drilled at a depth of 7,050ft utilizing the EDC-63 rig. Investments surrounding the project are estimated to be \$1.432m. It is worth noting that the well is being placed on production.

BP

BP, a British exploration company, has completed drilling a new gas-development well in its concession area in the Mediterranean Sea.

TAURUS W-2

The well was drilled at the depth of 7126ft utilizing the DISCOV-2 rig. Investments surrounding the project are estimated at \$15.862m.

TAURUS N-2

The well was drilled at the depth of 7159ft utilizing the DISCOV-3 rig. Investments surrounding the project are estimated at \$6m.

PETROSILAH

PETROSILAH, a joint venture between EGPC and MERLON, has completed drilling a new oil-development well in its concession area in the Western Desert. The production rate of PETROSILAH was 288,558 barrels of oil as of December 2015.

WARD 1-2

The well was drilled at the depth of 8,550ft utilizing the TANMIA-1 rig. Investments surrounding the project are estimated at \$1.786m. It is worth noting that the well has still not been placed on production.

BAPETCO

BAPETCO, a joint venture company between EGPC and Shell, has completed drilling a new oil exploration well in its concession area in the Western Desert. The production rate of BAPETCO was 1,511,089 barrels of oil as of December 2015.

NEAG 2-E

The new well was drilled at a depth of 9,984ft utilizing the EDC-72 rig. Investments surrounding the project are estimated to be \$2.564m.

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 316,051 barrels of oil as of December 2015.

ABRAR-30

The new well was drilled at the depth of 7,040ft utilizing the EDC-2 rig. Investments surrounding the project are estimated at \$1m. 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 1,916,763 barrels of oil as of December 2015.

MEL W.D-9

The new well was drilled at a depth of 11,150ft utilizing the PDI-147 rig. Investments surrounding the project are estimated to be \$1.798m. It is worth noting that the well has already been placed on production.

PETROBEL

PETROBEL, a joint venture between EGPC and ENI, has recently completed drilling a new gas-exploration well in their concession area in Sinai. The production rate of PETROBEL was 2,997,380 barrels of oil as of December 2015.

W.FEIRAN-1

The well was drilled at the depth of 11,900ft utilizing the ST-3 rig. Investments surrounding the project are estimated at \$6.184m. It is worth noting that the well is being placed on production.

EGYPT OIL AND GAS

PEOPLE DEVELOPMENT

15TH MARCH 2016

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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Libyan Oil Production Crippled by Instability



Libya's oil output has fallen sharply since the beginning of instability in Libya in 2011 – from 1.6mb/d to 400,000b/d today, the Tripoli-based National Oil Corporation (NOC) announced in January, Arab News informed. While treaties have been signed to pacify and reunify the country, Islamic State's (IS) insurgents continue to attack key government energy infrastructure, which has led to a number of facilities closing, Reuters reported.

Riyadh, Beijing Sign 14 MoUs Including Nuclear Reactor Deal



Saudi Arabia signed 14 Memoranda of Understanding (MoUs) with China, including the landmark deal to build a high-temperature coolant gas nuclear reactor, on the first day of Chinese President Xi Jinping's visit to Riyadh, reported the Saudi Gazette. The other MoUs include a framework agreement for strategic cooperation between Aramco and the China National Petrochemical Company (SINOPEC). Aramco has been in talks with China's SINOPEC and CNPC discussing Saudi investments in the Asian country's refineries, petrochemicals, and marketing, Reuters informed. Aramco Chairman, Khalid al-Falih, made the

announcement during the official inauguration of the 400,000b/d Yasref oil refinery, itself a joint venture between Aramco and SINOPEC.

In October, it had emerged that Aramco was trying to buy a stake in a CNPC refinery, rumored to be worth \$1-\$1.5b. Further, an R&D agreement between Saudi Aramco and the Development Research Center of the Council of Government of the People's Republic of China was also signed. The Saudi King Salman took the opportunity to say that the two countries were striving to consolidate peace, both in the region and in the world, said Asharq Al-Awsat.

Iraq's Nassiriya Project Being Revived

The Iraqi oil ministry and newly established Dhi Qar Oil Company are reviving plans to boost the production and refining capacities of the Nassiriya field, after being delayed since 2014. At the time, the cost of project was estimated at \$10b, with bids coming from companies such as Lukoil and PetroChina. It is not clear if the same

companies will be contracted for the project or if the ministry will hold another a bid round. Officials state that Nassiriya has more than 4b barrels in reserves and the potential to produce 200,000 b/d, compared with a current daily output of 70,000 barrels produced by South Oil.

Es Sider and Ras Lanuf, Libya's biggest oil ports, have been closed for more than a year. Ras Lanuf was the target of a suicide bombing in January and Es Sider was attacked by long-range shelling – leading to major fires on oil tankers. In the same month, Benghazi's largest power plant was attacked and caught fire. Previously, in June 2015, IS claimed it had finally succeeded in taking former President Muammar Qaddafi's hometown, after overrunning a nearby power station in Sirte. According to analysts, IS is targeting police and army training centers to create fear and prevent the rebuilding of state security institutions, a strategy previously deployed by al-Qaeda in Iraq. The attacks have signaled IS's long-term ambitions to extend its influence in Libya, especially as it comes under increasing pressure from bombing campaigns by the US-led Western coalition in Iraq and Syria, informed BBC.

In December, representatives of Libya's two rival governments signed a power-sharing agreement that called for the formation of a national unity government. However, the rival National Oil Corporations – one based in Tripoli, the other in Bayda – continue to compete over oil rights and exports. In addition, competing Libyan militias control vast swathes of the territory, vying for dominance over Libya's 'oil triangle' near the eastern capital of Benghazi, the country's most valuable economic asset, Bloomberg wrote.

In January, Tripoli NOC's Chairman, Mustafa Sanallah, met with France's Total, Italy's Eni SpA and the UK's BP, among other companies, in Istanbul, in an attempt to convince them to resume exploration in Libya, as a unity government is expected to take power this month. A key advantage to returning to Libya, he said, is Libya's low-cost of production – a barrel of Libya crude costs \$10 to produce.

GCC Cuts Fuel Subsidies, Revises State Budgets



The GCC countries have adopted measures to reduce state budget deficits mounting over persistently low oil prices, by primarily introducing cuts in fuel subsidies. Oman has increased gasoline prices, to be reviewed on monthly basis, as Trade Arabia reported. It has also adopted an austerity budget for 2016 with a projected deficit of \$8.6b in order to tackle the 50% decline in state revenues through introducing economic diversification, increasing non-oil revenues, and encouraging private sector investments, revealed Gulf News. The Bahraini cabinet has approved an amended price for petrol sales in the country, based on recommendations submitted by the National Oil and Gas Authority (NOGA).

The decision will cover 91 and 95 Octane and mark the first change in the price of gasoline in the country in 33 years. Bahraini Energy Minister, Abdul Hussain bin Ali Mirza, said that he expected the decision to have a positive impact on the economy and the environment as it promotes the efficient use of energy. Bahrain has already been implementing a comprehensive economic and fiscal reform program as a result of the imminent fiscal challenges. While the UAE has also announced to lower domestic prices for gasoline and diesel in January, Riyadh's major economic reform continues, encompassing subsidy reforms, tax rises, and privatization.

Shell Pulls Out of High-Risk, Low-Return UAE Gas Project

Royal Dutch Shell has announced that it will pull out of a multi-billion-dollar plan for the Bab sour gas field in Abu Dhabi, reported Reuters. Shell said that the decision was based on evaluation that the project was not suitable to the company in the "economic climate prevailing in the energy industry," in reference to the downturn in oil prices.

The UAE's Energy Ministry said that the commercial logic behind the decision was given by the fact that "cost of gas and the price of gas and LNG has dropped more than 50%". The project was meant to yield 1bcf/d of gas and aimed at domestic consumption. Shell won the tender for \$10b in 2013, enjoying a 40% stake.

US Removes Nuclear Sanctions on Iran

The White House announced in January that President Barack Obama had signed an executive order lifting the US economic sanctions on Iran over its nuclear program, reported CNN. UN and EU inspectors have confirmed that Iran has completed the necessary steps spelled out in the July 2015 nuclear deal to warrant sanctions being lifted. US Secretary of State, John Kerry, issued a statement saying that the International Atomic Energy Agency (IAEA) had verified that Iran "has fully implemented its required commitments." IAEA has also installed an Online Enrichment Monitor at the Natanz plant to monitor the level of uranium enrichment, measuring the amount of uranium-235 and the total amount of uranium processed in real time, insuring that Iran's nuclear program is for purely peaceful, power generating purposes.

In the aftermath, Iran has announced plans to boost its oil production by 500,000b/d, wrote Reuters. Major oil producers, particularly in the Persian Gulf, are concerned about Iranian energy entering an already concentrated oil market, now seeing prices in the \$20's. On the news that sanctions had been lifted, Gulf stock markets saw dramatic declines. Iran's plans are already under way to boost production from oilfields shared with Iraq – North Azadegan, South Azadegan, North Yaran, South Yaran, and Yadavaran - with a daily increase of 200,000 barrels, informed Press TV. Iranian Petroleum Minister, Bijan Nadar Zangeneh, added that the increase would take place within eight months, to be followed by a further surge to 700,000b/d in the years to come.

The US government will now allow foreign subsidiaries of American companies to trade with Iran. There remain other bans in effect in the US dealing with terrorism, human-rights abuses, and missile activities, wrote the International Business Times. This has led analysts to predict that European companies will



oust American investors heading to post-sanction Iran as EU was eagerly removing all their previously existing bans. Iran has hailed the US decision. Iranian officials explained that the sanctions relief would also allow the country to access around \$30b worth of blocked Iranian assets, \$6b-\$7b of which comes from oil sales, Press TV reported.

Saudi Aramco Considering Aramco IPO

Saudi Arabia has confirmed that it is studying plans to issue an initial public offering of a portion of Saudi Aramco, the world's largest oil company. A statement issued by the company said that options included the listing "of an appropriate percentage of the company's shares and/or the listing of a bundle [of] its downstream subsidiaries," wrote Reuters. Saudi Arabia is the world's biggest crude exporter and controls more than a tenth of the global oil market. Previously, Deputy Crown Prince Mohammed bin Salman had said that selling shares in Aramco was part of the Saudi government's privatization plans to raise money in an era of cheap oil. He also stated that such a move would help promote transparency and counter corruption, adding that it was in the interest of both the Saudi market and Aramco. A decision is expected in the next few months. Saudi Aramco controls 261b in oil reserves, ten times more than ExxonMobil, with a market value of \$319b, informed Bloomberg.



Some analysts perceive the move as 'an epochal change in the oil industry,' yet unexpected, given that Saudi's foreign exchange reserves are over \$6b. Nevertheless, large deficits due to a low oil price have spurred more conservative fiscal policies.

Tunisia Extends Chorbane License for Gulfsands Petroleum

The oil and gas exploration company, Gulfsands Petroleum, has been granted a two-year extension to its Chorbane hydrocarbon exploration license, recently ratified by the Tunisian authorities, Energy Voice reported. The duration of the first renewal period is now extended until July 2017 and has a minimum work obligation of 200km of 2D seismic and an

exploration well. Gulfsands, the operator of the Chorbane License, with a 100% working interest, has identified onshore prospects for drilling light oil and wet gas. According to the company's estimates, prospective net resource bookings for the Chorbane permit are at the level of 44.2mboe without risks.

Saudi Arabia to Invest \$109b in 54GW of Renewable Energy

Saudi Arabia plans to spend \$109b to install 54 GW of renewable energy by 2040, aiming to diversify the Kingdom's energy profile and preempt energy demand expected to rise 45% in this period of time, reported Al-Ekhabriya citing Frost & Sullivan's latest report. Saudi's overall energy demand is estimated to rise

from 69 GW in 2014 to 100 GW in 2040, tantamount to the energy demand of the remaining GCC states put together. The emphasis will be put on the installation of solar energy facilities accounting for 41 GW of the projected volume to be produced, Trade Arabia cited analytical sources.

Morocco Expanding Solar Projects

Morocco expects to invest \$9b in solar energy by 2020. The Moroccan Agency for Solar Energy (MASEN) hopes to rapidly expand production in renewables – to reach 52% of Morocco's energy needs by 2030, wrote Trade Arabia. The country's key solar program Noor 1 in Ouarzazate – projected to be the world's largest concentrated solar power plant – is expected to generate 500MW and power 1.1m homes by 2018, the World Bank predicts. However, progress on the Noor project has seen delays, as the inauguration of the first stage of the project has been postponed unexpectedly, The Guardian reported. The project's next phases – Noor 2 and Noor 3 – are preliminary scheduled

for 2016 and 2017. In January, MASEN launched a tender for bids to build a 400MW solar power plant as a part of Noor. In other positive renewables news, Morocco's January bid round for 850MW of large-scale wind energy projects may have set the record for lowest production costs at an average of \$30/MWh, according to Clean Technica. The pricing, revealed by Morocco's Energy Minister, is among the lowest costs ever estimated for wind energy – largely due to Morocco's advantageous Atlantic trade winds and some financial concessions. Morocco is currently the Middle East's largest importer of energy – requiring imports for 97% of domestic needs.

Algeria's Energy Export Volumes Drop 2.8%

Algeria's energy export volumes dropped to 74.7m tons of oil equivalent, down by 2.8% in the first nine months of 2015 due to increased domestic consumption and decreasing output, Reuters reported. The government has indicated, however, that crude oil exports had increased, without giving a precise figure. Oil makes up

95% of Algeria's total export and 60% of the state budget. As a result of declining global oil prices, energy revenues fell to \$25.8b, down by 45% in the given period of 2015. Algeria has stated its desire for greater foreign investment in its energy fields, but has seen disappointing results in attracting investors.

Oman Preparing Region's First Electricity Spot Market

The Oman Power and Water Procurement Company (OPWP), a member of Nama group, is making preparations for the establishment of a spot market system for electricity trading in the Sultanate, the first of its kind in the region, reported the Oman Observer. The project is slated to become operational in 2019-2020, opening up the electricity sector

to competition, while also facilitating Oman's ambitions for cross-border energy trade. With the spot market in place, an alternative route will exist for producers to sell power to the state-owned company outside of a standard Power Purchase Agreement (PPA). This way prices will be determined on a day-to-day basis for qualified producers.

Qatari Companies Sign \$500m Renewable Power Joint Venture

Qatar Petroleum (QP) and Qatar Electricity and Water Company (QEWC) are establishing a joint venture for the generation of electricity from renewable worth \$500m, scheduled to be launched in mid 2016, reported Gulf Base. The venture aims at building feasible renewable energy projects to

meet Qatar's growing needs, according to Zawya. Studies carried out in recent years had found enormous potential for renewable energy projects in Qatar, notably solar plants, as part of Qatar's efforts to diversify its sources of energy in line with the Qatar National Vision 2030.

Oil Prices Decline Hits Record Low



Global crude oil prices continue falling to record low with Brent down at \$28.07 per barrel and US West Texas Intermediate (WTI) as low as \$27.48. As the world sees a 70% drop of oil prices, a 12-year record low, the recovery of oil market in 2016 appears pessimistic,

Reuters reported. The oil price decline seems exacerbated over China's emerging economic slowdown and continuous overproduction of crude feeding global supply glut of 2mb/d of oil in excess of demand. OPEC is reported to have further cemented its

intransigence over supply reductions due to growing tension between Riyadh and Tehran. Both countries had been ramping up production in the anticipation of the final removal of international sanctions against Iran, lifted in mid January.

Slowing growth of China's energy demanding economy, the world's second largest oil consumer, is nurturing fears that the oil price decline will continue, which lead to further investment cuts by major oil producing countries, wrote the Financial Times. Global oil and gas investments are expected to fall to \$522b in 2016, the lowest in six years, following a 22% drop to \$595b in 2015, wrote Reuters citing data published by an Oslo-based consultancy, Rystad Energy. International oil companies – Chevron,

ConocoPhillips, Shell, Statoil - have published their 2016 plans to cut their spending, sell assets, shed jobs, delay or resize projects, renegotiate supply contracts, use less complex technology, and focus solely on projects with the highest returns on capital. Nevertheless, OPEC stated in its World Oil Outlook 2015 that \$10t worth of investment in the oil and gas industry will be needed through 2040 in order to meet world's energy demand, OilPrice reported. OPEC added that about \$250b would have to come from non-OPEC countries each year.

Experts predict that oil prices will further drop through Q1 of 2016, and could hit \$20. OPEC projects less optimistic future saying that oil prices are unlikely to return to the triple-digit level within the next 25 years. It expects oil prices to rise by an average of about \$5 per year in the first decade, only reaching \$80 per barrel in 2020, and hitting \$95 per barrel no sooner than 2040.

US Announced First Oil Export Shipments



The first US export cargo of 600,000 barrels of domestic light crude oil is to be shipped by Switzerland-based Vitol to its European subsidiary refinery in Cessier in January, Platts informed. The shipment comes after a 40 year ban on oil export was lifted in December 2015. However, according to RT, US oil

export may come in relatively small amounts of light crude, as the country still heavily relies on crude imports; producing 9.4mb/d, while consuming nearly 20mb/d.

In addition, Cheniere Energy Inc. has begun production at the first natural gas terminal designated to export gas from

America's shale formations, Bloomberg reported. Cheniere also plans to convert the receiving terminal into a giant \$11b LNG export hub, with six 'trains' of 4.5m tons a year to be constructed by late 2018 and a total capacity of 7.76bc/d by 2019, turning the US into one of the world's largest gas suppliers, WorldOil wrote.

Further, US shale oil production is to see a projected decline of 116,000b/d in February, adding to an overall drop of 640,000b/d, since the production peak in March 2015, Bloomberg informed. Experts estimate that US production will fall by another 500,000b/d this year as output from existing wells declines and fewer new wells come online to replace it, delaying production boost until 2017. Nonetheless, OilPrice stated that big offshore projects, scheduled to come online in Q3 and Q4 of 2016, may counterbalance the declining trend

Turkmenistan to Set up National Oil and Gas Company

Turkmenistan is to establish Turkmen National Oil and Gas Company (NAPECCO), based on a recently signed presidential decree issued in accordance with the country's Development Program for the industry until 2030, Trend News Agency informed. NAPECCO will conduct exploration, drilling, mining, and processing of country's hydrocarbon resources and implement international energy projects. Turkmenistan, one of the key suppliers of natural gas in the Caspian region for China and Iran, has recorded decline in natural gas export revenues, Reuters reported. Ashgabat's natural gas trade with Russia dropped to 4bcm in 2015, to be stopped altogether in 2016, with gas supplies to Gazprom coming instead from Uzbekistan. Moscow is thus believed to be pursuing a rule-and-conquer politics in Central Asia.

India Signs Nuclear Power Deals with US, Russia

Delhi is expected to sign a deal with the US-based Westinghouse Electric Company LLC to build six nuclear reactors in India in the first half of 2016 to get the country's nuclear power plans worth \$150b off the ground, Reuters reported. India is seeking to dramatically increase its nuclear potential by installing around 60 new nuclear power reactors with an overall capacity of 63,000MW by 2032, up from the current 5,780MW. The plan is a part of India's long-term energy strategy to move away from fossil fuels, to cut greenhouse gas emissions, and to avoid the dangerous effects of climate change.

In addition, Indian Prime Minister, Narendra Modi and Russian President, Vladimir Putin have agreed that Moscow will set up 12 Russian-built VVER 1200 nuclear reactors, with a rated capacity of 1,200 MW, in the country, The Economic Times informed. The deal was one of 16 bilateral agreements on civil nuclear energy, defense, and hydrocarbon signed during Modi's official visit to Moscow in January.

Further, India has also announced it was opening negotiations with state-run oil and gas companies from Africa to acquire more assets on the resource-rich continent in downstream industries, hydrocarbon exploration and production, Live Mint reported. Until now, Indian oil and gas companies have invested about \$8b in assets in

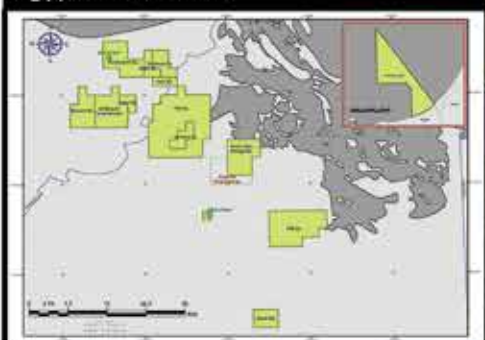
Mozambique, Sudan, and South Sudan, with future investment focus expected to shift to Tanzania, Libya, Ghana, Egypt, and Algeria.





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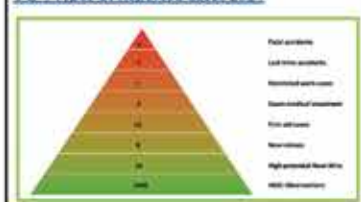
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Nigeria Seeks to Boost its Hard-Hit Oil Economy



Nigeria is to revise its 2016 budget rendered unfeasible amid rising economic difficulties over global massive decline in oil prices below \$38 per barrel, the level at which the government originally projected its spending, Reuters reports. Under the December budget, the government approved a 20% rise in public spending in 2016 in an attempt to boost the economy and critical infrastructure such as power and housing and to double its deficit to \$11b, wrote BBC.

Nigeria relies heavily on oil revenues to support state spending and has been heavily hit by low global oil prices leading to speculation that the Central Bank of Nigeria will need to devalue the national currency, Naira. Bloomberg reported that analysts expect a 20% revision in the Naira to 240-250 per dollar, in the third currency devaluation since November 2014.

The government is to adopt various measures to outbalance the turbulent period for the national economy. It is take a bigger debt. In addition, Nigerian Minister of Petroleum Resources, Emmanuel Kachikwu, stated that the government was planning an Initial Public Offering (IPO) for assets owned

by its national oil company, the Nigerian National Petroleum Corporation (NNPC), by 2018, Bloomberg wrote. The Oil Ministry also believes that the US will soon resume its oil trade relations with the country by purchasing 'very limited' quantities of Nigeria's crude.

Further, Nigeria has presented a comprehensive 13-point plan to renew power sector in the country. NNPC informed that the Port Harcourt, Warri, and Kaduna refineries have come back in production making enough gasoline in total 6.76m liters of gasoline a day, projecting an increase to 10m liters per day by end January 2016, to help stabilize supply in the country, according to Reuters. The ageing refining infrastructure in the country has suffered from years of neglect and perennial sabotage. The government aims to reduce gasoline costs by limiting fuel imports, and has announced it will scrap fuel subsidies, Bloomberg wrote. Lastly, Nigeria's plan to build a 456MW gas-fired power plant, Azura, outside of Benin City is finally becoming a reality, as the World Bank is set to guarantee the investment to begin the construction, All Africa reported.

Russia Records Oil Output and Gas Export Rise

Russia's oil output hits post-Soviet record with 10.73mb/d in 2015, up from 10.58mb/d in 2014, as small- and medium-sized energy companies cranked up the pumps despite falling crude prices, reported Reuters citing the Energy Ministry's data. Russia's crude export rose to 5.25mb/d in 2015, out of which supplies to countries outside the former Soviet Union jumped up 11% year-on-year to more than 4.42mb/d, informed Bloomberg. Experts have estimated that Moscow will increase its oil production further in 2016, reluctant to give in to OPEC's request to curb oil output, as new fields come online and ruble is to see devaluation, Europe Online Magazine wrote.

In addition, Gazprom, the Russian state-

run gas producer, also announced that its natural gas exports to Europe had increased by almost 8% to 159.4bcm in 2015, despite EU sanctions imposed on Moscow in retaliation for Russia's annexation of Crimea in 2014 and backing of separatists in Ukraine's civil conflict, Radio Free Europe/Radio Liberty reported. Moscow remains the largest gas supplier to the EU countries, meeting a third of its gas demand. The company has also approved its 2016 investment program worth \$11.71b in total, Reuters wrote. The investments include capital expenditure totaling \$10.81b and acquisition of non-current assets, according to the Scandinavian Oil & Gas Magazine.



Cyprus Extends Exploratory Drilling Licenses to ENI

The Cyprus government has approved a two-year extension for the licenses of Italy's ENI and its South Korean partner KOGAS to explore oil and gas reservoirs off the southern coast of the Mediterranean island, Hellenic Shipping News reported. The extension will facilitate ENI to evaluate the hydrocarbon potential in Blocks 2, 3, and 9 in Cyprus' exclusive economic zone. Although the consortium

study is in a preliminary stage, ENI is expected to start exploratory drilling in three areas in 2017 and continue until February 2018, Cyprus Energy Minister, Yiorgos Lakkotrypīs said. In December, Total, the French energy company, had also renewed its license to search for oil and gas off Cyprus for two more years, ABC News informed.

China Eyes New Investments amid Slowdown

China's oil demand growth is expected to drop to 3% in 2016 reflecting on the country's economic slowdown, despite lowering oil prices, Bloomberg reported. According to Barclays' analysts, oil demand rise is estimated at merely 300,000b/d this year, compared to 510,000b/d in 2015. However, China's industry association insists that oil demand is expected to rise 4.9% to 11.37mb/d this year, Reuters informed, as crude oil imports for strategic petroleum reserves may receive a boost from small refineries, despite an indicated decline in industrial usage of oil.

Meanwhile, China National Petroleum Corporation (CNPC), the country's biggest oil company, has sold 50% of its interest in the Trans-Asia Gas Pipeline Co. for \$2.3-\$2.4b, far below the market price, to China Reform Holdings Corporation, a state-run asset management firm. The

sale is considered a step in the right direction for CNPC and the government-controlled energy sector aiming to demopolize, restructure, and open up to investments, wrote the Financial Times. Further, Chinese firm POLY-GCL Petroleum Group Holdings has finished drilling two appraisal wells in the Calub and Hilala fields in the Ogaden Basin of southeast Ethiopia, with estimated deposits of 4.7tcf of liquid natural gas (LNG) and 13.6m barrels of associated liquids, Reuters wrote.

In addition, Tehran has commissioned China National Petroleum Corporation (CNPC) to develop the second phase of the North Azadegan oilfield project in Iran with a production output of up to 75,000 b/d, Mehr News Agency reported.





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Maintaining the Stability of the Domestic Fuel Market

AMR MOSTAFA

Deputy Executive Chairman for operations at EGPC

Egypt is well prepared for any future fuel crises. There are strategic plans to secure fuel supplies for citizens in the local market, especially butane (LPG cylinders) during the winter months. A factor in securing strategic supply is the assignment of Botagasco the distribution of all excess supply throughout the country, and therefore limiting smuggling to a great extent. Currently representatives from the Ministries of petroleum, supply, and local development are working on tightening control over fuel stations, as well as warehouses to prevent smuggling of petroleum products to the black market.

On a related note, securing long and short-term contracts with fuel suppliers is the next main goal for EGPC to help secure a steady supply covering all petrol stations nationwide. In addition, petrochemical projects, which are also expected to add-value to the national economy, will be an important factor in securing the fuel needs of all citizens in the local market. Diversification of energy, specifically renewable energy, will also boost the country's ability to meet its fuel needs.

The new petrochemical complex in the Suez Canal industrial annex is expected to produce 2.7m tons of petrochemical products using naphtha and the propylene project will generate 50,000 tons per year for local markets in times of crisis.

Relying on new petroleum agreements and exploration activity will increase our production levels of crude oil and natural gas, reducing the country's import bill.

The stability of the domestic fuel market is due to the regular pumping of fuel at a rate of 18,000 tons of gasoline per day, 37.5 thousand tons of diesel per day, and 1.2m cylinders per day. The strategic reserve will be a key element in resolving any future crises of fuel in local markets. EGPC is also working on the completion of the national plan to reform the energy system, which will help us to reduce energy subsidies. With the collapse of world oil prices it is expected that the budgetary allocation for subsidies will be less than EGP7b, declining or rising along with the price of a barrel of crude.

The final elimination of fuel crises in Egypt will coincide with the universalization of the second phase of the smart card system, which covers gasoline and diesel fuel. The first stage eliminated more than 90% of the smuggling operations and every liter in Egypt is being scrutinized and will not go to the black market mafia.

Egypt's Energy Hub Goal Begins with Fuel

HOSSAM ARAFAT

Head of the Petroleum Products Division at the Federation of Egyptian Chambers of Commerce

The decisive completion of the national plan to streamline budget allocations for energy subsidies, within 5 years, as well as the Petroleum ministry's plan to bridge the gap between production and consumption are the key ingredients for Egypt to reach its goal in becoming an energy hub for the Middle East. Reaching this objective will help Egypt attain a secure and more balanced energy mix within 10 years. However, to become an energy hub Egypt first needs to execute an energy efficiency plan over a period of more than five years, increasing efficiency of use by 12 to 15% per year, and thus saving between \$6-8b a year.

Egypt has yet to fully benefit from the sharp decline of oil prices to secure its fuel needs; so far only utilizing the decline in reducing its bill for energy subsidies. The lack of long-term contracts with fuel suppliers could cost Egypt. Ideally the contract should aim to secure its fuel needs for the coming 10 years, even with the price of oil likely to fall to \$20 in the near future. Neglect maybe the main culprit for the spread of the black market phenomenon, which costs both the government and the end users a significant amount per year. There are sufficient quantities in the local market to meet the needs of all citizens. The supply of petroleum products on offer at all the fuel stations can more than bridge the domestic consumption gap, which is precisely why the fuel crisis was resolved during the past six months with only a few minor incidents. There were no complaints from citizens about a shortage of petroleum products – benzene, diesel, butane – at fuel states across the country.

Regular fuel pumping operations taking place daily, by the Ministry and EGPC, were the main reason behind the disappearance of fuel crises in the local market, in addition to the boosting of the strategic reserve to last over a 15-day period in the occurrence of a shortage. Another measure taken that put an end to the butane crises that takes place every year was the storage of an additional 400 cylinders a month, besides the 1.2m cylinders that are pumped daily to meet the needs citizens, especially since the beginning of winter this year.

Rationalization, Subsidies and Smart Cards are the Key

OSAMA KAMAL

Former Minister of Petroleum

Willpower and determination are the first steps towards resolving the energy crises in Egypt. Rationalization is linked to the implementation of many key elements that cannot be dispensed with. In addition to, universalizing smart cards and listing all petroleum products onto this concrete system, and reducing energy subsidies by 10% over five years to free up EGP 10b for general budget.

Prior to this, however, the dollar crisis Egypt is suffering from needs to be resolved first, as the shortage of foreign currency is increasing the cost of import, not to mention the ongoing increase in consumption, which is rising at an annual rate of 10%.

It is important to note that the current budget deficit Egypt is suffering from is not the result of the yearly high import bill for fuel but because of the LNG Egypt imports at a price range between \$10 to 13 per million BTUs. Nonetheless the government is forced to pay these prices in order to alleviate the power cuts sweeping Egyptian homes.

The state must tighten its control and monitoring of the domestic fuel market to ensure the collection of the proceeds of the overall sale of petroleum products in the local market across the country. Reducing the value of subsidies in the budget is connected to the fact that EGP 100b worth of fuel is sold annually to citizens, meaning that the value of subsidies will reach EGP 60b by the end of June 2016.

Cooperation between the concerned parties in the government was a crucial factor in the stability enjoyed by the domestic fuel market during the current fiscal year, compared to previous years where Egypt suffered energy crises due to severe fuel shortages in the domestic market thanks to the ever rising consumption rates. Even so the state has to differentiate between the rich and the low-income groups when it comes to energy subsidies if this stable state of affair is to continue. Subsidies must go exclusively to low-income families.

In the end my proposal is that the state provides electricity to the poor for free, but only if the subsidies directed to other classes are gradually withdrawn. Ideally the deserving classes in society that would receive subsidies should include the aged, pensioners and any citizen whose income does not exceed EGP 1,200.



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PARALLEL PATHS: Energy Reform in Egypt and Jordan

Exclusive Interview with H.E Khaled Irani, Former Energy Minister of Jordan, exploring the remarkable similarities between Jordan's past experience and Egypt's current challenges.

By Robert Barron

A decade ago, Jordan faced major challenges in its energy sector. The country faced limited domestic energy resources; a strong dependence on imported energy; a subsidy system which was overwhelming the state budget; and rapidly increasing domestic demand for energy. This should sound familiar. Jordan's path towards energy reform over the past decade is closely related to the path Egypt is now taking. That's not to say that the two paths will be the same or that Jordan has figured it all out. But in a number of ways, Jordan can serve as a model as Egypt takes new steps towards energy reform – particularly in the fields of subsidy reduction and attracting investment. To gain an understanding of these paths, Egypt Oil & Gas spoke with His Excellency Khaled Irani, who previously served as both Energy Minister and Environmental Minister of Jordan.

Subsidies

For much of the past decade, Irani has been near the center of the Jordanian government's efforts to overcome the country's energy challenges. Among the largest challenges he faced, which Egypt also now faces, was subsidy reduction. When he became Minister of Environment in 2005, "we were heavily subsidizing electricity and fuel," amid quickly rising global energy prices. At the time, energy subsidies accounted for 5.8% of Jordan's total GDP. Jordan's energy subsidies has been possible due to subsidized imports from neighbors,

notably Iraq, but at the time prices were rapidly rising and traditionally low-priced imports were drying up. Amid financial strain, the government sought to eliminate energy subsidies over the next five years, leading to "a lot of painful decisions," Irani said. Despite the challenges, the effort proved successful, at least in the beginning, as spending on energy subsidies fell from 5.8% of GDP in 2005 to 2.5% of GDP in 2007 to 0.3% in 2009.

According to Irani, the key for Jordan was raising awareness and creating properly functioning social safety net, ensuring that those who need assistance receive it, while those who can afford to pay the full cost of their energy do. In virtually all countries with energy subsidies, the rich, who have many more options for consuming energy, benefit much more than the poor. This was the case in Jordan, Irani says. "We agreed that, if we get out of subsidies, we will pay the poor the difference, rather than pay the rich." Jordan raised wages for government and private sector employees and stepped up cash transfers to Jordan's poor.

Communication was also key. "These decisions are never popular, but communication was very important," the Minister said. "For fuel prices, we set up a system where prices rose monthly. You saw it at gas stations where every month new prices are announced based on international prices, the cost of transportation, et cetera." These explanations also found their way to the

bills consumers received in the mail: "In electricity and water bills, we started to show how much the treasury is paying for your electricity. So when you receive a bill for 10 pounds, and the real cost is 30 pounds, we tell you on the bill. Consumers know the real value of their con-

Jordan's national electricity provider, "had debt of less than \$100m in 2010. Today it is \$5b because we got back into subsidies."

These are challenges that the Egyptian government faces today. In 2013, Egypt's energy subsidies accounted for

"These decisions are never popular, but communication was very important."

sumption."

In 2009, however, Jordan's subsidy reforms were disrupted. The country relied heavily on low-priced Egyptian gas to support electricity production, the supply of which began to decline in 2010. "When I became minister of energy in 2009, it was the peak of gas imports from Egypt. Almost 70% of our electricity was produced from Egyptian gas and suddenly that gas started to deteriorate." As a result, Jordan was forced to import more expensive fuels to produce electricity, which raised energy prices so rapidly that subsidies were re-implemented in 2010 – again putting heavy pressure on government coffers. In 2011, 17% of government expenditures and 5.5% of GDP went towards electricity subsidies to cover the cost of more expensive fuels. NEPCO,

around 7% of GDP. In 2014, government subsidies accounted for one third of the total government budget, 75% of which went towards energy alone. The Sisi administration has made subsidy reduction a priority and in July 2014, sweeping measures were taken to cut energy subsidies; diesel prices increased by 64%, gasoline prices increased between 40%-78%, and natural gas and heavy-fuel prices rose quickly as well. Electricity prices have increased for mid-to-high range households by an average of 19% this fiscal year. As a result, consumers have been forced to deal with higher prices for all goods, not just energy, headline consumer prices increased by 11.9% in 2015, partly the result of higher energy prices.

Egypt has benefited from low global oil prices, scaling back subsidy-reduction

"Almost 70% of our electricity was produced from Egyptian gas and suddenly that gas started to deteriorate."

“Egypt must look at financial and convertibility issues which will encourage investors to come”

plans from full elimination to 30% over the next five years. Going forward, however, a key challenge facing the Egyptian government will be the development of social safety nets which ensure that those needing help receive it and those who do not need subsidies do not receive them. Irani said that “in Jordan, the social safety was easier to build than it may be in Egypt with 90m people.” With 90m people and major advances to be made in registration and confirmation of poor people, Egypt faces serious difficulties in building such a safety net – a challenge that was easier for Jordan: “In Jordan’s case, we have a good database for employees and the Social Ministry has good records for poor people, their income and support they are receiving.” The challenge of recordkeeping in Egypt has been demonstrated by the numerous delays of Egypt’s “Smart Card” system – in which subsidized gasoline is unavailable to consumers without a government-issued card – which is reportedly set to start in May after a number of delays.

Diversifying

Another key reform in which Irani took part, which echoes Egypt’s current efforts, was Jordan’s goal to diversify energy resources. In 2007, Jordan developed a new energy strategy looking towards 2020. The government set a “target of a different energy mix that depended on three main pillars: for Jordan to depend more on local resources, to be more environmentally friendly, and to diversify energy resources.” For Jordan, this meant developing untouched shale reserves, tapping local gas, pursuing nuclear energy and driving towards renewable energy.

Progress in these areas has not been easy. Efforts to develop Jordan’s shale, where it is “among the eight largest countries in the world in reserves,” have been delayed by low prices, although Irani remains optimistic for the future. Jordan’s nuclear plans have been stalled by environmental challenges, particularly water. The area where Jordan seems to have made the most noticeable progress may be renewable, an area Egypt also hopes to expand, aiming for a 20% renewables energy mix by 2020.

Among Irani’s major achievements in government were the introduction of the Renewable Energy and Energy Efficiency Law; the development of Jordan’s Energy Efficiency Incentives Program; the development of the Renewable Energy Transaction Policy; and the establishment of the Renewable Energy Fund. While too many to describe in detail, these programs have a common thread, they aim to make investment in Jordan’s renewables sector more attractive and easier. “We made sure our laws and regulations were very inviting,” Irani said. The effort

has largely worked, according to Irani. Since 2010, “we have had 12 companies come to build solar farms producing 400MW-500MW. We have the largest private-sector windfarm in the region producing about 120MW. We have regulations which allow the private sector to sell electricity to not just the government, but direct sales to banks, hotels, hospitals and others.” For a region with a wealth of alternative resources to complement traditional fossil fuels, Jordan has been a leader in creating the legal framework to promote investment in renewables, Irani says.

Still, there is a lot more to be done to take full advantage of the region’s renewable resources. Among the most important challenges Egypt faces is declining foreign currency reserves – which has worried a number of companies hoping to enter the Egyptian market. In short, Egypt’s declining foreign currency reserves, now around half of 2010 levels, seem to undermine expansion of the energy sector. Central Bank policy prohibits banks from lending dollars to projects which will receive payments in Egyptian pounds. And as the Egyptian government usually insists on paying for energy in Egyptian pounds, financing for energy projects which require international purchases becomes more difficult. Jordan has worked to create a system which prevents this problem. Irani stated that stability and currency convertibility are key for promoting investment in the energy sector: “In addition to the regulations that the investor and developer are looking for, you need financial stability, stability of laws, taxes and so on. An example is convertibility. In Jordan you can gener-

ate dollars and send those dollars outside the country, while in other places you cannot.”

Over the past two years, Egypt has been progressive in promoting renewables investment, particularly through the feed-in tariff program. The potential for renewables in both countries is extremely high, but both countries faced challenges. The key is developing the legal and economic institutions to support investment in renewables. “We are probably more progressed in terms of regulations and projects in renewable energy and the privatization of power generation. Egypt must look at financial and convertibility issues which will encourage investors to come, especially with renewables and gas,” Irani said. Jordan began down this path a decade ago. Egypt is quickly working to catch up – ensuring that eager investors are not scared away by financial regulations.

Going Forward

Irani is quick to point out the differences between Egypt and Jordan. He recognizes the challenges unique to Egypt: “The scale is so much different. We are 10m here in Jordan. In Egypt we are talking about a totally different scale.” He also notes that the resources available to both countries are quite different: “Egypt has better resources, especially after the gas discovery. By 2017 or 2018 Egypt will be in a better situation than today in terms of local resources.” This is important for subsidy reform, as Jordan did not have the domestic resources to keep reforms in place, as Egypt now does. He also recognizes that Jordan’s reforms have not been perfect and there is much to be done. Still, he believes that Egypt can learn from observing Jordan’s paths to reform and that the two countries face many of the same goals going forward.

Chief among these shared goals, com-

mon across the region, is a need for much greater energy efficiency. “Energy efficiency is a low-hanging fruit, but countries in the Arab world tend to ignore it. We spend double the energy to produce \$1 of GDP compared to Europe and the US.” A key weakness has been laws and regulations for promoting efficiency: “Efficiency policies have not really progressed as renewable energy policies have.” The challenge, Irani says, is that energy efficiency policy is not particularly exciting or easy to see: “It requires more awareness. With renewable energy, it is easier to see for the client, so they pay for it. With energy efficiency, you’re investing in something you don’t see.” Among the solutions, according to Irani, are tax incentives for energy-saving devices and governments leading by example: “One good example is the government just tendered for 12 of its buildings to showcase energy efficiency programs. So it is getting there but it’s much slower.”

Another important goal for Egypt, Jordan and the rest of the region going forward must be interconnectivity of energy – using both countries’ central locations to serve as regional hubs. While the limitations regional trade networks are obvious at the moment, the potential is also clear: “If we go back to before the problems of the region, the plan was to use Jordan and Egypt’s privileged location to bring gas from Egypt to Jordan to Syria and Turkey and on,” Irani said. “Political problems have obviously made it hard to use geographic location, but with a better regional political situation there are lots of potential projects that we can dream of. But for now, everything is on hold.”



“Energy efficiency is a low-hanging fruit, but countries in the Arab world tend to ignore it. We spend double the energy to produce \$1 of GDP compared to Europe and the US.”

The Dilemma of Egypt's Refining Goals

By Amanda Figueras

For Egypt, becoming a regional petrochemical and refined product exporter would be a dream come true. If this happens, Cairo would be a heavy-hitting geographic power player, able to lessen the burden on the state budget at a time when refined product imports are less accessible in foreign reserves.

Not all petroleum products—such as gasoline, diesel, and jet fuel—are refined domestically. In an interview recently published by Energyglobal, Egypt's former Oil Minister, and current Prime Minister, Sherif Ismail stated that Egypt spends over \$500m per year on fuel imports. This is the case even after agreements with Gulf countries such as the UAE have been reached in order to provide the country with petroleum products at discounted rates, grants, and credit arrangements.

If those products were refined locally, however, the result would be a significant spending reduction. In fact, in September 2014, the Government announced plans to invest as much as \$14.5b in developing the country's downstream sector over the next five years. According to Ismail Egypt was trying to boost its output of refined petroleum products by 5% to 10% each year, hoping to reduce its dependence on costly imports.

"The total investments that will be implemented over the next five years will be around \$14.5b and include \$12.5b in the refining sector and \$1.9b in the ETHYDCO project," Ismail told Reuters at the time, referring to a new complex that would produce ethylene and other petrochemicals.

Last year Minister of Petroleum, Tarek El Molla, started to implement the plan to revive what former ministers neglected, specifically the elaboration of the infrastructure required to distribute petroleum substances, in addition to the replacement and renovation of the old refineries.

Declining Output

Currently, Egypt has an oil production problem. Despite having the largest refining capacity on the African continent—amounting to 704,000 b/d according to the Arab Oil & Gas Journal, and 726,250 b/d according to Oil & Gas Journal—the nation does refine oil to a far lesser degree than that to which it is capable. Consequently, the country is unable to meet the growing domestic demand for petroleum products.

Egypt's refineries mostly process domestically produced crude oil, and refined products are mostly sold to local markets.

According to BP's statistical review, while the consumption of crude oil has increased by an average of 3% annually over the past ten years, reaching 770,000

b/d in 2013, Egypt's refinery output has declined by 29% from 2009 to 2013, dropping to 445,000 b/d according to OPEC. This marks a utilization rate of 63%, far below the average global refining utilization rate, which was set at approximately 80% in 2014.

In a paper titled Egypt: An Energy Supply Crisis Beyond Control? the energy consultancy firm, FACTS, attributes the mentioned decline in production to a national policy which encourages foreign oil producers to export more crude oil as a way to cover Egyptian General Petroleum Corporation's (EGPC) financial debt. As a result, while Egypt's petroleum production has declined over the past few years, crude oil exports have remained the same. Oil production, including condensates, dropped from 730,000 b/d in 2009 to 714,000 b/d in 2013. Simultaneously, crude exports remained virtually flat, hovering at 80,000 b/d as of late 2013.

In turn, there is a lower volume of domestic crude oil available for domestic refineries, and Egypt must make up for the difference by importing petroleum products and/or crude oil. This deficit can be attributed to shortage in crude oil supply and technical limitations due to aging refineries. Egypt imported about 145,000 b/d of petroleum products in 2014, according to Global Trade Information Services. Egypt also exported about 60,000 b/d of petroleum products the same year, as reported by the US Energy Information Administration (EIA).

According to Daily News Egypt, the Government's economic ties to Saudi Arabia, Kuwait, and the UAE permitted it to benefit from certain privileges in paying the value of petroleum substance shipments, easing the financial burdens and paying debts accrued via interest-free installments.

Since President Abdel Fattah Al Sisi took office, the Ministry of Petroleum has paid about \$3.6b of the foreign partners' dues in the petroleum sector. These dues were accumulated since 2009 until 2013. The foreign partners' dues declined to about \$3b by the end of August 2015. By facing its paying obligations, Egypt will be more likely to satisfy the domestic demand keeping at the same time the foreign currencies at home and leading to a stronger balance of trade.

Aging Infrastructure

Another major issue with Egypt's refining capacities is that, of the nine refineries that exist—mostly located in the country's northeast, in Cairo, Alexandria, Suez—, nearly all are roughly 50 years old.

While certain investments have been made to upgrade them over the past years, their theoretical capacity is expected to have decreased over time.

According to Dr. Alaa Idris, the Associate Chair of the Petroleum Engineering De-

partment at the American University in Cairo, mechanical integrity limitations due to aging and technological redundancies result in capacity reductions over time.

Actually, despite Africa's substantial oil resources, refining capacity on the whole continent remains limited. As such, countries like Angola and Nigeria export crude oil, only to import refined oil at an additional cost. Refining capacity has always been much lower than crude output, but this gap widened significantly. On the other hand, as a report published by KPMG suggested, this points towards a big opportunity for investors to build refineries, buying crude oil domestically and selling it either locally or internationally.

Are Subsidies Slowing Egypt's Downstream Progress?

In an effort to remedy the issue of its aging infrastructure, Egypt plans to invest \$14.5b in its downstream sector. Unfortunately, the investment will not be fully materialized within the five year plan originally announced, due to the limitations caused by subsidized domestic fuel prices, according to BMI Research. A number of expansion and modernization projects will boost refined fuel output, but will fall short of meeting domestic demand.

Their study suggests that over recent years, refined product demand has increased supported by favorable government fuel subsidies aimed at stimulating economic growth and maintaining public content.

In a try to ease the problem, for fiscal year 2014/2015, the Egyptian government cut oil products subsidies costs to \$9.2b as part of the subsidy reform, which led to an increase in oil product prices in 2014.

The huge cost of energy subsidies in Egypt has also contributed to the country's high budget deficit and the struggles the EGPC is facing in payment of its debt to foreign operators.

The corporation owes foreign oil and natural gas operators billions of dollars, which has led them to delay their investments in existing and new oil and natural gas projects.

Projects and Investments

Egypt is adopting a mix of investment strategies in refinery upgrades and construction of new capacity to meet the nation's target for more high-quality light and middle distillate products and a reduction of transportation fuel imports, Hydrocarbon processing reported.

The government had plans to increase refining capacity by over 600,000 bpd by 2016; however, these plans will not be fully realized.

Approximately \$2.7b will be utilized throughout 2015 and 2016 to complete the implementation of the Egyptian Re-

fining Company's (ERC) project in Mos-torod, according to Wael Al-Orabi, the company's Commercial Director.

Another \$1b has already been invested in the project by the Qalaa Holding subsidiary, with total investments estimated at \$3.7b Egypt Daily News reported.

In the economic development conference which took place in March 2015 in Sharm El-Sheikh, some new projects were announced, such as a hydrocracking complex at the Assuit Oil Refinery Company at a cost of \$2.8b, as well as a new desalination unit in Amreya Oil Refinery Company which could produce 49.6 tons of petroleum products annually at a cost of \$250m.

In July 2015, Technip Italy, a world leader in project management for the energy industry, finalized two joint agreements valued at a total of \$2.9b with Egypt-based companies for upgrades of two refineries. The investment had an estimated total value of \$1.5b, aims at maximizing diesel production, and will introduce the most modern refinery technologies in Upper Egypt to meet the growing local demand for petroleum products.

In another development, Technip Italy and SACE announced the finalization of a joint agreement with Middle East Oil Refinery (Midor) for a project to modernize and expand the Midor refinery near Alexandria, Egypt. The investment has an estimated total value of \$1.4b and aims at improving the production quality of the plant, considered the most advanced of the African continent, by increasing its refining capacity from 100,000 to 160,000 b/d.

The Azeri state energy firm SOCAR showed its interest in buying stakes in refineries in Egypt and in participation in the African country's oil refining sector. Azerbaijan is exporting about one million tons of oil and refined products per year to Egypt.

An EGPC report estimated the needs of the domestic market at 551,155 tons of diesel, 330,693 tons of butane, 165m tons of gasoline, and also 551,155 tons of fuel oil per month.

The annual domestic consumption of gasoline is 6.7m tons, of which gasoline octane 80 takes up nearly half at 2.97m tons, followed by gasoline octane 92 at 2.7m tons, while gasoline octane 95 accounts for about 440,924 tons, according to figures in the closing account of the FY 2014/2015 budget.

The money saved from cheaper imports and recent subsidy cuts that raised the prices of petroleum products by 70% should be used to reinstate Egypt as the main refining hub for the region. All this investments are a hope, only after some years can efforts be proven positive in Egypt's quest to boost its refining industry.

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Egyptian Industries

Between the Dollar Crisis and the Energy Challenges

By Robert Barron

*G*rowing into 2016, most of us are reflecting on the year gone by and looking forward to the year ahead. Many in the Egyptian industry, however, may be less than optimistic about 2016. The past year has been difficult for Egyptian industry, which has been consistently inhibited by dollar and energy shortages. Despite efforts to alleviate these challenges, these problems are not likely to be fully resolved any time soon. Looking to the year ahead, it may be helpful to recap the roots of these problems, how they affected Egyptian industry in 2015 and their possible out-

For much of the past five years, the result has been energy cuts, as the government seeks to balance gas supplied to electricity production and gas supplied to industry. Over the past year, the government has decided to cut energy to energy-intensive industries and to increase the supply to power plants providing energy to Egyptian homes, which may have serious economic repercussions. In short, power-generation received "100% of its needs and then we give the rest to factories," EGAS Chairman Khaled Abdel Badie told Bloomberg in July 2015. Gas to factories decreased by around 22% in 2015, according to EGAS. In the World

"Power generation receives 100% of its needs and then we give the rest to factories."

look for 2016.

Energy

Egypt's energy challenges will not be news to Egypt Oil and Gas readers. Since 2011, the Egyptian government has had a strained relationship with many international energy firms – failing to pay bills or diverting natural gas to the domestic market that it had previously agreed to export. As a result, production declined for much of the past five years, while domestic energy demand has been increasing. In 2015, production of both petroleum and natural gas fell, despite generally good news in oil and gas exploration and electricity production. Further, Egypt's antiquated electricity infrastructure, pushed past its capacity, urgently needs investment.

Bank's yearly "Ease of Doing Business" rankings, Egypt ranked 131 out of 189 total countries in the world, a very disappointing showing for a country of Egypt's size and advantages. There are many factors involved in the ranking, but one stands out: Egypt ranked 144th globally in "Getting Electricity."

These cuts have been especially problematic for energy intensive industries, such as cement, steel and fertilizers, where production and energy are closely tied. The squeeze these industries are feeling has been obvious in headlines and company statements. Samir Naamany, the commercial director of Ezz Steel, the largest producer of iron and steel in the Middle East, said that "the biggest problem we faced in 2015 was the lack of energy, which led

"The biggest problem we faced in 2015 was the lack of energy, which led to a decline in production and exports in our factories."

to a decline in production and exports in our factories." Ezz Steel announced severe losses in 2015, "principally due to constant disruption of utilities and lack of natural gas," a company statement said. Solb Misr, another steel company, announced major losses in 2015, due to operating at 25% capacity through eight months of 2015. Egypt's cement industry was also affected; the head of Egypt's cement producers association said the industry had lost 40% of its production capacity due to energy cuts. Suez Cement, which has sought to convert to coal due to gas shortages, reported an 81% decline in year-on-year profits in November 2015.

From a larger perspective, energy cuts have proven damaging for the overall Egyptian economy. Capital Economics, a research group, estimates that manufacturing output in Egypt contracted by almost 30% year-on-year from June 2014 to June 2015, due to the combination gas shortages and foreign exchange problems – the second major challenge industry faces. Egypt's economy slowed through much of 2015, with growth falling from 4.3% at the end of 2014 to 2.4% in 2015 – far lower than projections at the beginning of the year. In January, the World Bank cut growth projections for Egypt to 2.9% in 2016, down 0.7% from the Bank's June projections.

The good news is that industrial gas

supplies have increased during lower-demand winter months, which factories hope continues. In late December, an official with EGAS stated that due to decreased winter demand, Egypt has been able to decrease gas imports and meet the full needs of high-consumption industries such as steel, cement and fertilizers. "The gas supplies are now more regular and we hope that this problem does not recur in 2016," Naamany of Ezz Steel said. The question on the minds of Egyptian manufacturers is: what will summer bring?

The New Year may hold some positive news. Low global energy prices are good for Egypt – a net importer with major budgetary issues. As demand increases in warmer months, Egypt's limited dollars will go further towards buying the gas it needs on the international market. The government has urgently aimed to expand electricity generation capacity, adding nearly 7GW of power in 2015, and is expecting at least another 3GW in 2016. According to Electricity Minister Mohamed Shaker, "We believe that this summer will be better than the last. We are anticipating 2,500-3,000 MW of existing projects that we are accelerating." Aid from Saudi Arabia and other Gulf states will help meet domestic needs, and while still two years from production, the discovery of the Zohr field in August bodes



well for Egyptian supply in the future. Still, there are some troubling signs. Despite lower energy prices and numerous public commitments to repay debts to international energy companies, which will hopefully catalyze exploration and production, government arrears owed to energy firms actually increased to \$3b at the end of 2015, up from \$2.7b in October. This problem highlights the second major problem facing the Egyptian government, and thus Egyptian industry, in 2016 – American dollars and Egyptian pounds.

Dollars and Depreciation

The other major challenge facing the Egyptian industry is monetary – a lack of dollars in the Egyptian monetary system, and a deflating Egyptian pound. Since 2011, political instability has led to a serious decline in tourism revenue and foreign investment – major sources of dollars for Egyptian banks. Currently, Egypt's foreign reserves are around \$16.5b, around half of 2011 levels. Declining foreign reserves and other economic struggles have led to devaluations of the Egyptian pound (three times in 2015 and more expected for 2016) and have led to inflation of nearly 12%. The result of decreasing dollars and an inflating pound is more expensive imports for Egyptian industry, which is already feeling the crunch of decreased production capacity due to diminished energy supplies. As inputs, imported and domestic, have become more expensive, and as production has slowed due to decreased energy, companies are able to produce and export less, further adding to Egypt's for-

ign currency shortage. Egypt's energy and currency issues are in an almost self-perpetuating slide.

As a result of declining foreign reserves and to slow the flow of dollars leaving the country, the Egyptian government has implemented currency and import restrictions. Interest rates of 10%-15% make credit expensive to businesses and importers, who also object to restrictions on foreign currency deposits – which put daily caps on deposits and withdrawals of \$10,000 per day. On December 21, the Central Bank of Egypt announced new regulations which require importers to provide a 100% cash deposit on new letters of credit, rather than the 50% previously required. Importers must also obtain documentation directly from foreign banks, rather than from clients, and imports of luxury goods and “unnecessary imports” have been more heavily regulated. In some industries, including the energy industry, government policies preventing banks from offering dollar loans for projects which will be paid in Egyptian pounds further complicates industry growth and investment – preventing firms from obtaining the inputs and equipment they need.

Through November 2015, Egypt's non-petroleum exports had dropped by 18.7% year-on-year. And while basic economics says that a devalued pound should stimulate exports, this has not been the case according to some in Egyptian industry. “It was expected that as an exporter I would benefit from the devaluation of the pound, because my products will become cheaper in the international markets, but the

lack of hard currency led to a decrease in production and we were unable to increase exports,” Magdy Tolba, Chairman of Cairo Cotton Company, said. Tolba believes that price increases in “water, electricity, fuel and insurance and rents, is what has removed the local producer from domestic and international competition.” Tolba said that interest rates of up to 15% and import regulations have raised the costs of materials and production, which harms his company's ability to be competitive in international markets. Mennatullah Sadek, Director of Investment for GB Auto, shared the experience, saying

“Water, electricity, fuel and insurance and rents, is what has removed the local producer from domestic and international competition.”

that “for the first time in 40 years, the factory stopped producing for 20 days during September and October, because the material and components would be delayed in ports as banks were unable to measure the dollar.” In order for a cheaper Egyptian pound to positively influence exports, credit, energy and inputs must be easier to obtain.

Mentioned above, international experts are not particularly excited about Egypt's prospects for 2016, cutting growth projections to a modest 2.9%. The tourism sector, which was showing improvement earlier in the year, have been hurt by the Russian airline crash and other instances of violence. “For Egypt, the contraction in foreign

currency inflows that would accompany a shrinking tourism industry would not only negatively impact growth, but would exacerbate the existing foreign currency shortage,” the World Bank said in January. And if gas supplies to Egyptian industry continue to be squeezed and other factors continue to limit exports, the cycle of reduced production leading to reduced exports leading to reduced foreign reserves will continue.

Unfortunately, the primary bright spot currently is international support. In December, Saudi Arabia and Egypt pushed on with an \$8b package offered

by Saudi King Salman to assist the Egyptian economy. Egypt also received \$500m from the African Development Bank and \$1b from the World Bank. A \$1b loan of China is expected soon, with some indication that a larger \$15b package is being negotiated. In 2016, the government would probably like to raise interest rates in order to generate greater demand in the Egyptian pound and decrease the demand for dollars. However, higher interest rates would put greater strain on Egyptian business – already facing an array of challenges – and would increase the debt owed by the Egyptian government, which is already high. In 2016, Egypt faces a series of difficult decisions, in which industry is likely to feel the pain.

Egypt

Is Not Suffering from \$30 Oil. Here Is Why.

By Tamer Ismail, Country Editor



Having reduced its foreign arrears from \$7b in 2013 to \$3b in 2015, discovered the largest Mediterranean natural gas field, and received investment commitments for a combined \$24b from BP and Eni, Egypt's energy sector seems to have a positive outlook, while other neighbors suffer.

Meeting Local Energy Needs

Currently a net importer, Egypt utilizes its entire oil and gas production to meet its booming energy demands, which the government provides at heavily subsidized rates. It imports six to eight cargoes of LNG per month at market price from a variety of sources including, Algeria's Sonatrach, Gazprom, Noble Energy, and BP to fill the supply-demand gap.

The drop in oil prices will help Egypt save on its energy subsidies bill, which stood at EGP 126b in the FY of 2013-14, expected to decrease to EGP 56b in the FY 2015-16. The oil price downturn will also help the country save on its energy imports bill, projected to be worth almost \$16b in 2015-16. This will allow it to conserve its scarce foreign reserves currently used to buy oil and gas and divert extra cash to reduce its budget deficit, which stood at 11.5% of GDP in FY 2014-15. More importantly, in the long-run, the savings will

allow the Egyptian government to progress in its goals to fully meet its energy requirements, paying its foreign arrears to international companies and diversifying its energy mix.

Strategic Energy Hub

The discovery of the supergiant Zohr natural gas field off the North-Eastern shore of Egypt - together with Israel's Leviathan and Tamar, and Cyprus's Aphrodite gas fields - have the potential to change global energy trade flows and elevate the Eastern Mediterranean region to global energy hub status.

The scale and proximity of these fields provide for stronger collaboration and infrastructure sharing opportunities between the three countries. For instance, Israel lacks the large integrated export gas infrastructure system, while Egypt has two currently idle LNG conversion terminals on its Mediterranean coast line. Much of Israel's produced natural gas would be converted in the Egyptian terminals in order to be shipped to Europe that currently relies on Russia for the majority of its gas needs.

This alliance would be of significant strategic importance to Europe that has experienced increased Russian aggression on its Eastern borders. Similarly, Turkey's re-

lationship with Moscow has recently deteriorated. It will become a rival to Russian gas with its geographical proximity and diversify Europe's energy suppliers list.

Steady Investment Flow

In 2011, when political turmoil gripped Cairo and the government accumulated large foreign arrears to international E&P companies, the amount of foreign investments in the country exhibited a sharp decline. However, since the unrest has declined and the government has been making steady progress on its payment arrears, investments have kicked in over the recent months. The Italian oil company, Eni, has committed to a \$12b investment to develop the Zohr natural gas field and BP announced a \$12b plan to invest in West Nile Delta's natural gas projects.

Moreover, worries over reduced Gulf states' support for Egypt due to decreased oil revenues have not materialized. The Saudi Ambassador to Egypt, Ahmad Al-Qattan, speaking at a December 2015 press conference in Cairo, has assured that oil prices will not affect Saudi Arabia's assistance to Egypt. Egypt's security and economy are pivotal for the security of the entire region. Therefore, the allocation of aid to Egypt is going to be considered a top priority for GCC countries' own security.

Egypt, as opposed to most of the other GCC states, has a highly skilled and technical workforce. Eng. Kareem Abou Shady, Business Developer & Technical Sales Manager of a leading machine-shop solutions provider, DOTS For Engineering Industries, mentioned in an exclusive interview with The Oil & Gas Year (TOGY), Egypt 2016 that "Egyptian companies have been working with international drilling clients for over 10 years in the most difficult environments on- and off-shore, often times putting them on par with international players in bidding rounds."

In addition to the abundance of a skilled workforce, the local manufacturing cost is extremely competitive due to favorable EGP exchange rates, pushing down projects' breakeven points. This in part explains why exploration projects and investments are on the rise in Egypt, while most of the other regions have been experiencing cut-backs. Eng. Amr El Manhawey, General Manager of Seaharvest Oil & Gas Services, emphasized in an exclusive interview with TOGY, Egypt 2016 that "Egypt, unlike other countries, has lower project overheads and salary structures, translating into lower production and operation costs."

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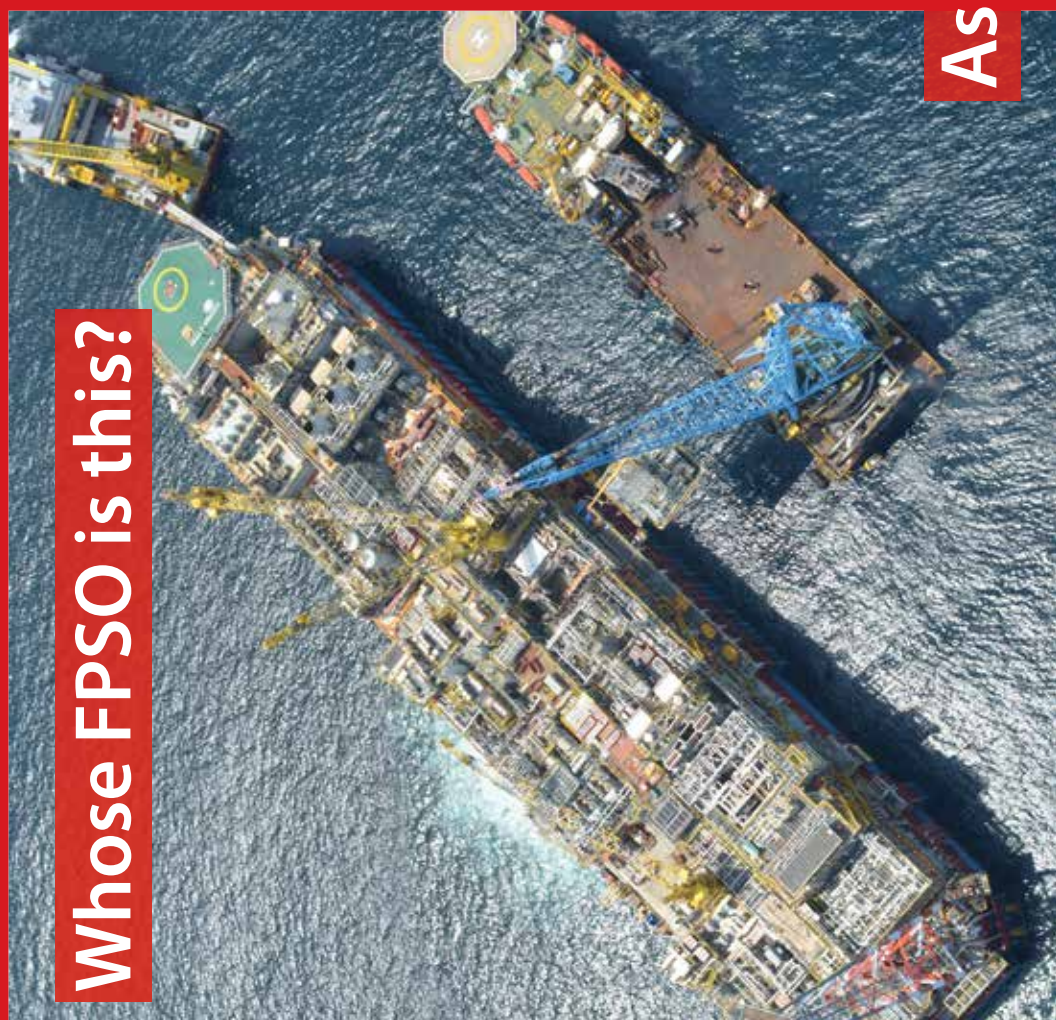


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The Who's Who of the Global Energy Industry



Optimizing Egypt's Fuel Distribution Scheme

By Nataša Kubíková

Drivers of cars, taxis, micro buses, and trucks know the drill by heart. Line up in front of a petrol station, wait for hours, fill up your tank, and drive away. Fuel shortage crises in Egypt erupted on countless occasions in the last few years. The government seems in denial that these crises are genuine; reflecting on deficiencies in the country's downstream sector. Yet, it has started implementing a new fuel distribution system. The government awaits its new smart cards scheme to do the trick, and generate a massive improvement in fuel supplies to end customers.

Egypt saw fuel shortage crises over lack of diesel in March, June and mid September of 2015. Queues outside fuel stations showed that the country's distribution system is lagging behind, unable to meet demand. The government responded in two ways. It has repeatedly stated a vague explanation that it was merely rumors about fabricated fuel shortages or about pending fuel price hikes that were behind the problems, causing confusion and chaos with 'unjustified crowding' at filling stations, according to state officials quoted in the Egyptian press. People's panicky filling their cars with fuel made petrol stations ran out of diesel or gasoline, to which

effect the government increased supplies to different governorates accordingly. Instability in the market was thus attributed to this social dynamic solely. Further, there some reported cases of fuel being hidden at filling stations to be later sold in the black market, which supported government's claims that instead of fuel shortages, illicit trading with fuel and rumors were behind temporary reductions in fuel supplies. Another response from the government introduced a new electronic fuel distribution system based on smart cards issued for every depot, petrol station, and customer. The smart cards scheme is envisaged to tackle several problems in the industry.

Monitoring Fuel Distribution Channels

The government seems to have denied structural deficiencies openly. It states that the main reasons for fuel deficiencies are smuggling and abuse of subsidized fuel by consumers. Experts, however, point to mismanagement of fuel distribution across the country, depletion of state budget finances, inefficient downstream infrastructure and low production output at local refineries. It is therefore difficult to estimate if smart cards will contribute to the structural reform and deliver much needed improvements in the country's downstream sector.

The official aim of the nationwide program to tackle recurring diesel and petrol deficiency is to modify the petroleum products distribution system by increased monitoring and optimizing fuel supplies to end customers. The project comes in three phases.

In the first phase, which started in mid 2013, completed in mid 2014, GPS devices were installed in tanker trucks and smart cards readers were produced for gas stations. In addition, a national electronic database of distribution points – depots, storage tanks, and companies was set up, which allows for a centralized monitoring of fuel transportation and distribution cycle. It is designed to tackle smuggling outside of the country and curb corruption in fuel trade.

The second and third phases were kicked off in October 2014. In the second, electronic meters at fuel depots and on storage tanks were to be installed. They will be connected through regional headquarters of each distribution company, as well as linked to the Egyptian General Petroleum Corporation (EGPC), in order to better track distribution flow and record the volume of supplied, consumed and available fuels, ensuring that subsidized fuel products reach citizens. It will allow to observe fuel consumption patterns, as

a necessary prerequisite for future rationing for efficient supplies. The third phase was to issue smart cards for citizens who are eligible to receive subsidized fuel. Customers' cars will be registered in the national database and their fuel consumption will be recorded. The government rejected to set any limitations to purchased volumes of fuel per customer amid vocal outcry against the proposed measure.

The implementation phases were reported in the media in a rather incoherent way, and hard to say if the planned progress has been achieved or not.

Optimizing Fuel Subsidies

The government has rested its trust in the new system. It envisions that it will lead to restructuring of fuel subsidies, curb fuel smuggling, combat the black market, and provide a necessary basis for fuel self-sufficiency of the country in the near future.

It is clear that hopes are high. Expectations are fed with a notion that smart cards will provide a one-for-all solution. Aspirations, as projected by the government, however, remain to be fulfilled.

The government aims to trim the budget deficit by achieving efficiency in the consumption of subsidized fuel, and thus decrease the burden of fuel subsidies on the state budget by 25%

to 30% in up to six years. The fuel subsidies slimmed in two consecutive years. Overall fuel subsidies decreased to EGP 56b in the 2015/2016 fiscal year, compared to EGP 76b in the previous year and EGP 100b the year before. The subsidies share of the budget, initially predicted to remain at the level of EGP 61b in 2015, was reported to further decline by additional 30-35% amid low global oil prices. The cuts thus raised fuel prices by 78% since 2014.

What is more relevant, however, is the fact that according to an earlier statement by the finance ministry, 80% of overall fuel subsidies do not reach eligible citizens, who need such a support. According to previous reports by the World Bank, it was more than 60% of the fuel subsidies used by people from higher social classes, while poor low-income citizens had reached out to merely 7% of the overall subsidies. Until now, all Egyptians could have bought unlimited volumes of subsidized fuel with no restrictions. The government has therefore continued with the plan to implement the smart cards system, which will allow only eligible citizens to buy unlimited amount of fuel for subsidized price, and those without smart cards will pay unsubsidized price. This move is estimated to possibly save up to additional EGP 40b of the fuel subsidies package in the state budget a year, without rising fuel prices, ridding the state budget of yet another burden, as efficiently as the bread subsidies savings seem to have achieved over recently introduced systematization through bread smart cards.

The bread smart cards scheme, launched under the former president, Mohamed Morsi, allocates subsidized bread to eligible consumers, and has reduced paid out subsidies by more than 30%, according to official figures. The wheat consumption for subsidized bread decreased and in effect reduced the size of wheat imports needed. The current government tends to foresee similarly efficient structural changes to be introduced through the fuel distribution system. However, this expectation may be more difficult to live up to in the oil industry. Not only has the bread smart cards system imposed a cap on the amount of purchased loaves per family member per day, it has also prevented people from buying in bulks and necessarily cut sales of subsidized bread to ineligible consumers. The infrastructure of bakeries seems to be operating efficiently in the country, with much lower investments needed; incentives for black market sales of bread are less promising.

In comparison, the petroleum products sector is more appealing for illegal sales, offering higher profits. The gap between subsidized price of fuel and market price of gasoline and diesel are incomparable with bread prices, which in itself is almost an invitation for joining unlawful fuel trading. In addition, the volume of fuel sold per customer will not be limited, which may further encourage black market and lead to

overconsumption of fuel. Further, the sector is far more demanding in investments, technologies, and maintenance than bakeries, as fuel distribution to end customers undergoes a complex cycle of production processes and shipments. This indicates that the fuel sector scheme may be less likely to strike the same balance as bread smart cards did, or generate overall savings on petroleum products for the state budget in the upcoming years due to cracks in the downstream sector's structures and processes. There are still many other challenges ahead.

Smuggling and Black Market

As fuel commodities are by default more prone to be traded on black market or smuggled, this undoubtedly represents one of government's worries.

Egypt's fuel has been smuggled abroad at a rate of 20% of overall supplies each year, according to an official quoted in the Egyptian media. The first phase of the new fuel distribution system allowed monitoring truck routes, which, according to EGPC, led to a drop in smuggling operations in the country by 60% in September 2014. Nonetheless, it was also reported that fuel smuggling through tunnels and waterways from the Sinai town of Rafah had increased at the time, despite Egyptian state's operations against fuel shipments to Gaza in 2013. In raids, banned underground tanks and tunnels in the area transferring fuel to the impoverished Palestinian territories had been destroyed. No further cases of disclosed smuggling routes were documented since, or other related achievements of the Egyptian state were witnessed. The figures are therefore difficult to measure or verify or use as a basis to assess the impact that the new monitoring system has had on the sector.

In fact, it appears that the Egypt's government is facing a persistent conundrum in detecting smuggling routes, despite medialized previous successes. Petroleum Minister, Tarek El Molla called for a meeting with heads of fuel companies in October 2015 to help the government prepare a comprehensive plan to tackle smuggling and black market with petroleum derivatives. It was first then concluded that aside of the GPS devices, ATC system is to be installed in fuel trucks. Meters would give accurate updated information about the shipment channels. As this comes more than a year since the alleged completion of the first phase of the project, uncertainties remain about what effects the new monitoring system may deliver in terms of cross-border smuggling. Equally so, it remains to be seen to what extent the system may guarantee fuel supplies stability and counter domestic black market.

The Federation of Egyptian Chambers of Commerce had previously stated for the press that as there is no cap for consumption of subsidized fuel defined, black market within the country is unlikely to evaporate. According to experts, the given rate of 20% of fuel illegally smuggled outside of Egypt

includes an unknown rate of fuel being sold in the black market within the country. The issue, however, seems to be muted in the media and in official statements, with cross-border smuggling taking priority over curbing domestic diversion of fuel flows from the official supply chains.

Two main explanations of this trend are at hand; pricing policy and fuel patronage networks. Experts have stressed that large discrepancy between subsidized price and market price of fuel is making prospects for the black market highly tempting. The pricing policy, however, is not the single variable in the equation. There are reported phantom petrol stations that exist only on the paper and the data about the number of petrol stations, depots and transportation routes were missing in the national database until recently. Government's strategy to minimize fuel trading outside of official channels would thus need to embark upon a major initiative to formalize such businesses and adopt a comprehensive and efficient legislation to that effect, as EOG learned already in October 2014, speaking to Sherif El Diwany, the then Executive Director of the Egyptian Center for Economic Studies. Other experts noted that in order for the formalization of fuel distribution businesses to be completed, the government will face a complex of insurmountable obstacles. This relates to reported extensive patronage networks that created the core of the fuel black market in the country. The networks are believed to be a legacy of country officials controlling such channels, operated by their affiliated gas stations owners, who both have vested interest in preserving the price gap in the midst of lacking oversight, management, and control.

The government appears to be focusing on short-sighted vision of curing slandered state funds on subsidized fuel, without addressing related structural problems, such as minimizing negative effects of low production in refineries, aging infrastructure, smuggling or black market webs. A complex enhancement of the fuel supplies infrastructure aimed at overhaul reforms of the downstream sector with targeted investments may be a more promising strategy in a long term that may lead to financial and structural sustainability and guarantee fuel deliveries to citizens.

Lack of Clarity amid Delays

Currently, the implementation phases of the smart cards system are seeing delays, and remain veiled in unclear progress.

The delays have been accompanying the implementation of the program from its onset. Initially, first components of the system were to come into effect in July 2013, which was delayed over the then political context. What followed was that the government announced in October 2013, that the scheme was to come into operation some time during 2014, but this did not materialize. In January 2015, a schedule was set and the smart cards were

to start functioning six months later, in June 2015. It was only a few days before the project was to come into force, when the government said it would delay it further, until all smart cards were delivered to customers and all provinces were covered.

At the time, E-Finance, the company commissioned to operationalize the project, explained that the government was slowing the process, as it continued waiting for consumers to register and obtain their cards, but did not specify any particular obligatory deadline to follow. And E-Finance officials stated for Daily News Egypt that the system was ready to go with more than 12,000 selling points distributed across the country's gas stations. In May 2015, some 3.7m cards were issued, which were to be distributed to 27 provinces, according to the company's Chairman, Ibrahim Sarhan. In Q3 of 2015, E-Finance's project manager responsible for the smart cards scheme, Khaled Abdul Ghani, told the media, that some 162,000 cars had been added to the database from all provinces, in addition to 100,000 cards issued for tok-toks, bringing the total number of cards for direct consumers to 5.5m. Initially, it was reported that the program aimed at issuing 1m fuel cards for diesel consumers and 5m cards for petroleum consumers, which would suggest that the target has been met. In January 2016, Abdul Ghani added that additional 50,000 consumers were registered, out of 6.2m recorded as eligible for fuel subsidies. In December 2015, the government proposed yet another deadline in May 2016, without giving any indicative information as to the progress or its capacity to accomplish the program.

Although the publicized information is difficult to unify to get a clearer picture of the progress of the project, what is more debatable is when it will take effect, and to what extent it may help resolve the recurrent fuel crises.

Towards Fuel Self-Sufficiency

The delays represent merely a fragment of challenges that the Egyptian government is about to stumble across in relation to the downstream sector. Rising demand of fuel, prospects for continued over-consumption of diesel and gasoline, and insufficient production capacity of local refineries may weaken intended effect of the smart cards system. Projected savings through optimized fuel subsidies may easily be swallowed by petroleum products imports, if Egypt delays much needed improvements of the structures and processes in the sector.

The government is thus still to outline a complex energy sector reform that will incorporate all individual measures to achieve stability and sustainability on the fuel market. Without a clear strategy, Egypt's aspiration for fuel self-sufficiency is most likely to remain unfulfilled in the foreseeable future.

New Generation Concept: VOS Navigates the Oil Price Waves



By Andrea Cavo - Operations Manager , Carlo Crovetto - Charterer

We have just left behind a difficult year for Offshore Shipping. Extremely harsh business conditions have been forcing many companies all across the industry to implement often dramatic cost-saving and re-structuring measures. In 2016 the global Oil & Gas market continues with the alignment of operations and investment strategies on the basis of the ongoing, low oil-price reality. However, market fluctuations are part of the business in which we operate and the key to success is being flexible enough to add value in all circumstances. In such a challenging environment, Vroon Offshore Services (VOS), a leading maritime offshore-services provider with over fifty years' experience in the business, has continuously been developing and enhancing its world-class offshore-support solutions.

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VOS' fleet consists of Platform Supply Vessels, Anchor Handling Tug Supply Vessels, Emergency Response and Rescue Vessels, and Subsea Support Vessels - managed out of four Offshore Management Companies located in Genoa (Italy), Singapore, Den Helder (Netherlands), and Aberdeen (United Kingdom) with a geographical focus on the North Sea, Mediterranean Sea, Red Sea, Black Sea, Africa and South-East Asia.

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to be successful, and meeting the ever increasing Offshore market performance requirements, VOS has been investing in an extensive new-building program consisting of:

- Six Platform Supply Vessels - Ulstein PX121 design.
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- Two Walk-to-Work Subsea Support Vessels - 80mtrs KCM design.
- Six Anchor Handling Tug Supply Vessels - 65mtrs about 90t bollard pull KCM design.
- Two Subsea Support Vessels - 68mtrs KCM design.
- Ten Emergency Response and Rescue Vessels / Field Support Vessels.

The designs of these vessels are based on a new generation concept developed by VOS' Performance and Engineering Department, reflecting both client specifications, market requirements and in-house offshore expertise. Focusing on fuel efficiency, crew & charterers' personnel comfort and operational flexibility, the VOS fleet is capable to deliver a wide range of services supporting Offshore contractors from the seismic survey phase, through exploration & production, till de-commissioning.

VOS has considerable experience in the Egyptian Oil & Gas offshore markets and is committed to develop its presence, and market position in the years to come. VOS is proud to be a business partner of successful Oil & Gas companies in Egypt, both on the MED and Red Sea side, providing safe and efficient walk-to-work solutions, anchor-handling support and various supply services.



VOS is strictly committed to safe practices in all its operations, and in everyday actions. Safety is a "mindset", an integral part of the VOS organisation, involving all employees, and is supported by a behavioural-based safety management programme called Leaders in Safety (LiS) rolled out throughout the VOS fleet. Through the LiS program, VOS has been reinforcing the cultural approach to safety both onboard and ashore, with the ultimate goal of guaranteeing injury free operations and smooth operations. We invite you to have a look at our "Vroon 24 movie" on the VroonGroup

YouTube page to experience our safety mindset.

Together with its local partner Pan Marine, VOS will continue to serve its Egyptian clients, actively assisting them in identifying the safest and most efficient solution to their day-to-day operations, and is looking forward to meeting you at the 8th Mediterranean Offshore Conference & Exhibition (MOC) to be held in Alexandria (Egypt) on 19/20/21 April 2016 - stand C14.



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Across the Technological Horizon: R&D Solutions for Egypt's Downstream Sector

By Emad El-Din Aysha, PhD

Global technological breakthroughs in nano-applications are accelerating in the post-production or downstream sector of the oil industry. Egypt desperately needs to utilize these advances to solve many of its outlying economic problems related to the petroleum industry. The question is whether the scientific and industrial infrastructure of the

country is suited for riding this technological wave that encompasses everything from petrochemicals to refining to midstream and even upstream.

The quick answer is no. As it stands, downstream in Egypt is underperforming. Evidence of this can be found in the petrochemicals sector. Plastics are one of Egypt's top ten imports, standing at \$3b in 2014, according to the United Nations Comtrade Database.

Its exports were at the much smaller figure of \$1.6b. Is this disparity a matter of feedstock or lack of technical expertise or investments? Similar gaps emerge elsewhere. At first sight, Egypt's fortunes when it comes to fertilizers – another example of petrochemicals – appear better with exports standing at \$742m and import at \$161m. Yet, even here there are mismatches. Egypt imports higher quality fertilizers,

which feeds into the drain on the country's hard currency reserves. The same holds true of pesticides, many other chemicals, and pharmaceuticals, all being implicated in the petrochemicals industry.

Why has the country so far not addressed these trade disparities by identifying root causes and taking concrete steps to rectify them? Without resolving these outlying issues first, Egypt will not be able to take the next technological leap that will bring it up to speed with downstream round the globe.

Economic Mismanagement and Human Resources

A part of the problem with petrochemicals in Egypt has been the public sector mentality, a petroleum expert with extensive experience in the private sector explains. Like the Toshka land reclamation project (an ambitious project to reclaim half a million acre of desert land) the focus was on large headlines for picturing massive national projects that ignored feasibility studies. Another area of policy neglect did not take into account the issue of comparative advantage in natural resources endowments. Egypt, in the 1980s, did witness a surge of exploration and production activity with largely promising estimates of the country's gas reserves. The problem was that these estimates did not account for the competition, particularly from regional energy giants like Saudi Arabia, which gets its feedstock for plastics, fertilizers and other petrochemicals almost for free while extracting oil. But this was no excuse, the expert said, since any resource gap can be compensated for through sound planning, management, and technology.

The larger problems afflicting downstream lay in Egypt's education system due to a lack of emphasis on the downstream sector and other petroleum and energy-related subjects, the expert explains.

Most universities in Egypt do not specialize in chemical engineering, only chemistry. Most Egyptian universities do not have petroleum engineering departments to begin with. Topics related to the oil industry are also dispersed across curricula even at leading private sector universities like the American University in Cairo (AUC), British University in Egypt (BUE) and Future University in Egypt (FUE). Metallurgy, while intimately related to petroleum, is studied as a specialization in the Mechanical Engineering Department, under the Materials and Manufacturing specialization. The other specializations are Mechanical Design, Industrial Engineering, Robotics, and Power Engineering.

Chemists who graduate from institutions of higher learning are eagerly employed by the oil and gas sector, that is true, but their skills are more generic, given their education. They can work just as easily in pharmaceuticals as in oil and gas, after some re-skilling at the hands of the employer. Petrochemicals, however, are more difficult and demand a proper degree in chemical engineering. Even Petroleum Engineering Departments deal almost exclusively with upstream - exploration, production, drilling, and oil recovery, trying to compensate downstream with a handful of specialized courses in petrochemicals. Other energy-related topics get listed under environmental sciences and renewables.

Attempts to have Petroleum Engineering Departments cover the broader remit of petroleum and energy studies have not always been successful. Ironically the older, less well-funded public sector universities in Egypt - Cairo, Alexandria, and Suez - are the ones best equipped for the downstream industry, bunching petroleum engineering with petrochemicals, and mechanical engineering. Suez University deserves special mention because it has its own separate department of Petroleum and Petrochemical Refining within the Faculty of Petroleum and Mining Engineering. This is in addition to the four other departments of Petroleum, Geological Engineering, Metallurgy, and Mining Engineering. That being said,

there are different educational models on offer that we need to be mindful of when it comes to upgrading downstream.

Matching Knowledge and Needs

The older ways of teaching at Cairo and Suez Universities have their advantages. The system churns out fully qualified engineers for the downstream sector, explains Dr. Amr Serag-Eldin, Professor and PENG Chairman at the AUC's Department of Mechanical Engineering. The disadvantage, however, is that the educational institutions do not keep up to speed with the latest advances in the field. Having separate departments and schools, the approach taken by his institution, allows higher education to focus on the fundamentals of science and engineering first, then deal with practical applications later. The basics of power engineering, for instance, are the same as those in physics - thermodynamics, fluid and gas mechanics, the photoelectric effect, etc. A science background is a must. With these basics in place, there are qualified graduates who can do their own research afterwards and specialize as they see fit. It's a question of learning how to learn he says. Serag-Eldin adds that having separate departments does not mean the university cannot pool resources and set up multidisciplinary programs and laboratories. The School of Science and Engineering, in fact, deals with a broad range of petroleum-related disciplines, such as engineering for pipelines, renewables, project management, and industrial engineering. Nano-tech is also increasingly crossing disciplinary boundaries in science and engineering.

The real onus is on the private sector, explains a petroleum engineering professor from another institution. Firms have to involve themselves more in higher education through donations and grants to finance research and simulation labs, internships, training programs, specialized schools, etc. There is not enough demand out there for petrochemicals to be taught at university since there are only five petrochemicals companies for every 50 upstream companies in the country, he adds. The upstream sector needs petroleum engineers so universities gear themselves towards industry demands.

The way university finance works is also partly responsible. Financing is not determined only by tuition fees but by the composition of the board of trustees of any private sector university. If they are not 'oil men' - so to speak - then the finances will not be geared towards downstream sector, he explains.

Trustees have no objections to working with oil firms and representatives and have no legal restrictions against donations from the petroleum sector, but with established competitive petroleum and petrochemical universities in the Gulf Arab states, it is hard to gain the right kind of attention from wealthy benefactors for the Egyptian education sector. According to an official at Zewail City, the center of technical excellence, it does not deal with oil and gas, although energy-related fields are high on the institution's list of research priorities. The focus instead is on renewables, denying Egypt's petroleum sector an avenue for cutting edge research in the latest buzzword for the industry - nano-tech.

Melding Up and Downstream with Nano-Tech

Nano-tech applications are a game changer in the industry, according to a petroleum and energy expert, Dr. Magdi Nasrallah, as they are increasingly bridging the gap between up and downstream. Just as nano-applications go into drilling and pressure-volume-temperature (PVT) fluids, reservoir engineering and improved and enhanced oil recovery (IOR/EOR), they are also increasingly making its way towards the downstream sector. Nano-particles are used to influence fluid viscosity of crude oil in pipelines and for corrosion mitigation; at the level of the fluids. Manufacturing the pipeline itself comes also with the help of nano-materials, and nano-coatings are

applied to protect regular piping. The nano-technologies that go into building corrosion resistant pipelines are the same technologies that go into the upstream building of drill rigs where corrosion resistance, shock resistance, thermal conductivity and weld ability are persistent problems.

Viscosity is a problem that stretches from upstream into downstream. Reducing the viscosity level of crude extracted from a reservoir helps oil flow better in pipelines after extraction in the post-production or downstream phase. Closely related to this are problems with emulsification - water and oil droplet mixtures and scaling along the walls of pipes.

Viscosity, emulsification and scaling problems hold true, incidentally, of EOR, particularly when dealing with heavy grades of crude oil. The techniques used to dislodge crude in the tertiary phase of oil recovery become all the more effective if the viscosity level is lowered. When it comes to the CO2 injection technique used for EOR, there is also the issue of sequestering the CO2 underground and nano-materials can play a role there, says Dr. Adel M. Salem Ragab, Assistant Professor of Petroleum Engineering at the FUE's Petroleum Engineering Department. Most of the oil in the Western Desert is heavy oil and CO2 is a useful technique that has been earmarked for the region through field-studies and surveys carried out by Drs. Mahmoud Abu El Ela, Helmy Sayyoudh, and El Sayed El-Tayeb of Cairo University.

Another upstream-downstream challenge is upgrading bitumen and heavy crude oil, substances that are difficult to handle and transport due to their high density and viscosity. Nano-catalysts can be used to carry out this upgrading on-site, in combination with hydrogen/methane production. According to Ragab, certain nano-materials have been used in oil refining and the petrochemicals industry for more than 100 years, in the form of Nanoparticles Catalysts. During the last two decades nano-tech has made substantial contributions to refining and converting fossil fuels as well. Mesoporous catalyst materials such as MCM-41 are being used for refining while nano-filters and particles are being used to remove harmful toxic substances such as nitrogen oxides, sulfur oxides, and related acids and acid anhydrides from vapor, and mercury from soil and water. Nanomembranes for enhanced separation of gas streams and removal of impurities from oil are also becoming a possibility with the latest advances in the field.

A nano-expert, Dr. Ahmed Noah, formerly a professor at the AUC, adds that polymers go into both up and downstream. Polymers are macroparticles and, strictly speaking, do not count as nano-tech, but nano-applications can enhance their effectiveness. Nano-tech and polymers were also making their way into refining to improve the efficiency of the catalytic process at the level of energy used and utilization of hydrocarbons. They also help broaden the range of feedstocks that can be used.

Other new nano-applications related to EOR involved repairing the damaged walls of a depleted reservoir, along with nano-chemicals that can be used to change the porosity and permeability characteristics of reservoirs. Nano-science is even entering into hydraulic fracturing for shale oil and gas. Instead of relying exclusively on aquifer water nano-fluids and nano-particles can be used as well to cut down on water usage. This would mean a boon for arid countries like Egypt and Algeria.

Nano-science is finally getting the attention it deserves in Egypt with research financing for petroleum-related studies. A national R&D plan can help ameliorate many of the problems, along with reforms in the educational system. The key realization here is that investment in nano-applications at the upstream level will begin trickling down the post-production value-chain, and vice versa.

Policy Options and Prospects for Egypt's Downstream Sector

By Emad El-Din Aysha, PhD

Egypt's refining industry suffers from a series of mismatches in the downstream sector. Refineries are not designed to process certain grades of crude that nonetheless are supplied to them. Business sources explain that the same holds true of petrochemicals. The end result of this has been excess capacity, underperformance, underinvestment, and technological backlog.

This results in an underperforming sector that suffers from financial and technological deficits and a lack of backward linkages from petroleum to the rest of the economy. In petrochemicals, the prices of plastic articles in the Egyptian marketplace – even small shopping bags – have been going up. Yet the prices of the feedstock of plastics, the basic chemicals derived from oil and gas, have been going down globally in tandem with crude prices. A problem that highlights the negative effects Egypt is facing as a net importer of plastics.

Refining and petrochemicals, needless to say, are the backbone of downstream or post-production. The classical textbook definition separates refining and petrochemicals from midstream – transportation through pipelines, tankers, trucks, and from

marketing – sales and distribution of finished petroleum products. In industry-speak, however, these three stages are increasingly being lumped together.

The byword for ameliorating inconsistencies in the downstream sector is therefore 'integration,' explains a petroleum expert who prefers not to be quoted by name. Oil majors like BP and Chevron and national oil companies (NOCs) like Saudi Aramco and Malaysian Petronas are fully integrated, upstream, midstream and downstream, enjoying their own refining and petrochemicals, sales departments, subsidiaries and investments. The very nature of downstream is then changing as a consequence of the integration, the expert adds.

Egypt needs to develop its downstream sector more than ever before given the mounting fuel import bills and the severe strain it places on the whole economy by depleting the hard currency reserves. The issue at hand now is to identify, in detail, the full range of problems afflicting Egypt's downstream sector in all its stages and look into policy options for resolving them – keeping country and company comparisons in mind.

Currency Feedbacks and Planning Challenges

The current dollar crisis has revealed just how susceptible the petroleum sector is to global currency fluctuations and domestic inflation, if only because international oil companies (IOCs) operating in Egypt insist on being paid in US dollars. When Egypt's hard currency intake is hit by a shortage of exports due to stalled factories, high volumes of much needed import paid for in foreign currencies and terrorism scaring off tourists then petroleum entities like the Egyptian General Petroleum Holding Company (EGPC), even if operating at optimum capacity, cannot pay back what they owe to foreign operators like BP and ENI.

What is less well known, explains the anonymous expert, is that the downstream sector is hit even harder by the dollar crisis for several additional reasons. One is that when IOCs do not get paid they insist on being given a larger share of their crude output, which they keep to themselves, depriving Egyptian refineries of their feedstock. A second problem is that with delayed payments the operators, in turn, delay their deliveries to local vendors, forcing Egyptian companies to seek energy from other sources to meet their con-

tractual commitments, putting additional strain on hard currency reserves, since oil transactions internationally are denominated in dollars. A final problem is that downstream, much like most manufacturing industries in Egypt is heavily dependent on imports paid for in dollars.

The pipelines constructed here in Egypt, whether to connect drill rigs or export oil and gas, are made out of component parts from abroad that are first purchased for hard currency, imported and then welded together here. There is no shame in this as most developing nations have to import materials and technologies, but it is an issue that needs to be resolved over the long run.

The key is planning, says the anonymous expert. All petroleum projects are long-term. Development projects in oil take four to five years on average. For natural gas this can stretch to ten years, since the back-time needed to build liquefaction facilities has to be incorporated into planning and from early on; it is cheaper to export gas in LNG form than through pipelines. Much the same holds true of petrochemicals. As profit margins in downstream are much smaller, by comparison with upstream, the planning stage is essential,



capital costs go down, while profits go up, he says. Producing methanol, for instance, demands an investment of over \$900,000 to generate a single job. Producing polypropylene (PP) packaging bags derived from methanol, however, demands less than \$20,000 per job. Iran has finally woken up to this potential and has plans to build more than 30 industrial cities to develop oil and gas downstream projects with an emphasis on methanol downstream products, which include PP consumer goods such as plastics.

Egypt seems to have recognized this potential, and has undertaken similar measures. The Egyptian Petrochemicals Holding Co. (ECHEM) was set up in 2002 specifically to execute a 20-year long National Petrochemicals Plan, according to Oil & Gas Journal (OGJ). In addition, given that the cost of petrochemical feedstock is highly volatile, tied to other factors such as economic circumstances and population trends, flexibility is another key ingredient of strategic planning for downstream, OGJ explains.

Improvements in Integration and Regulation

In the context of slimming currency reserves and downstream economics, planning deficiencies can be resolved through integration. The petroleum expert added that integration across the downstream chain revealed another seldom recognized problem with the oil and gas sector in Egypt, namely, the sheer number of firms in the petroleum sector, especially over the past 10-15 years. There were many separate refinery companies managing their own affairs without coordinating with other firms of their own kind or the upstream companies that supply them with crude. It would be better, he argues, to have a smaller number of larger firms integrated across the different facets of the downstream supply chain.

In Egypt refineries are increasingly beginning to integrate their operations with petrochemicals, according to OGJ, via grassroots projects where a refinery is co-located with a major petrochemical complex. EGPC is also brought in as a partner to insure feedstock supplies with Egyptian banks pitching in for stable local financing. A business source in petroleum adds that while this is the right approach to take, the problem is that upstream entities like EGPC, EGAS and GANOPE are tasked with managing the downstream sector too, multiplying their functions from being production partners in joint ventures to becoming government representatives busily enforcing rules and regulations.

The petroleum expert says that holding companies like EGPC and EGAS could do with a dose of integration themselves, doing an even better job of overseeing their subsidiaries if they owned and operated them directly. His advice is that these additional downstream oversight functions be parceled

off to a specialized regulatory body, allowing the two companies to focus more on upstream E&P activities than on distribution and managing local markets. Integrating gives a body a larger asset base but also more responsibilities for managing those larger assets, so it is better to remove other functions served by that company in tandem, he explains.

Indonesia has taken this path, with two separate regulatory bodies dealing with up and downstream – BP MIGAS (later SKK MIGAS) and BHP MIGAS, respectively. Indonesia's NOC, Pertamina, is a fully integrated upstream-downstream firm. Nonetheless it had to relinquish its powers over production sharing contracts (PSCs) to SKK MIGAS and its original monopoly power over the price of oil, gas and fuel products to BHP MIGAS. Indonesia still subsidizes many of its local fuel products, but BHP MIGAS has made sure that these fuels only go to deserving customers – keeping a watchful eye over Pertamina and its branches – while introducing competition between distributors through tenders. Indonesia, like Egypt, is a net importer of crude oil with many exhausted oilfields. But with the right upstream incentives put in place over the years, compensating investors for bringing in the right kinds of technologies, production rates have gone up and Indonesia has finally been able to rejoin OPEC in October 2015.

The petroleum business source adds that Egyptian downstream companies have been able to avoid merging for a long time because of subsidies on their feedstock, a circumstance that may change as energy subsidies are phased out. Consolidation through mergers and strategic partnerships are certainly advisable during economic downturns, says John McCreery, Head of Bain & Company's Asia Pacific Oil & Gas practice, but such decisions should always depend on the strategic context. A supply chain expert and freelance managerial consultant, Riyadh Nour, also cautions against too much integration, especially when it comes to petrochemicals and the plastics industries.

The key to sound economic management is competition, not monopoly. Merging a petrochemicals plant with plastic manufacturers would create a powerful entity but would deprive the consumer of choice in the marketplace, and with that come inefficiencies that eat away at quality considerations. Further, the OGJ article also reminds us that the Egyptian market is too small to absorb any surge in petrochemicals products; therefore, any growth in the sector will have to be financed by exports, a prerequisite of which is high quality products. In Europe all existing and new petrochemical substances, local or imported, must be registered by the industry in question with the European Chemicals Agency that oversees commodities required standards. If Egyptian products are to compete successfully abroad,

they must meet the regulatory requirements of those foreign markets and be able to offer demanded scope and quality of products.

Up the Downstream Learning Curve

Egypt's downstream sector must replicate other successful models, such as Iran mentioned above. It needs to build production facilities, produce its own pipes and create access to professional engineering companies and engineering, purchasing and construction (EPC) contractors. Once it is able to reduce imports of construction parts from abroad, it will insulate itself from currency shocks. There are positive signs in the offing. Egyptian engineering companies like Petrojet and Enppi have already made major contributions to the Egyptian pipeline market; dealing with design and commissioning respectively. Local engineering consultancy firms and pipeline inspection firms are pound for pound as good as global firms, says Ramy Magdy, a Senior Drilling Engineer at SUCO.

Riyad Nour adds that refining, even in its current dispersed state, was going up the learning curve at the level of skills training. He explains that in the past foreign partners in refining were not concerned with training refinery staff but that Egyptian companies were able to send their employees to study abroad or work with foreign and Gulf Arab oil companies to re-skill their workforces in line with international standards. Firms specialized in training, whether for refineries or even offshore rigs, were beginning to get licensed in Egypt, he says.

These local achievements need to be harnessed and expanded on. Measures have already been taken to ride out the currency storm, explains PICO International Petroleum's General Manager, Shawky Abdeen, with 20%-30% of arrears owed to foreign partners being paid in Egyptian pounds. Upgrading oilfield service companies is another avenue, as many of them already rely, to varying extents, on locally manufactured materials and designs, says another petroleum engineer. Local content stipulations and stringent quality specifications are the traditional policy tools used to achieve this, as Egypt Oil & Gas has documented. The anonymous expert also adds that more downstream people needed to be included in ministerial positions, whether from sales and distribution or midstream as well as refining and petrochemicals.

Integration is a delicate balancing act between too much and too little centralization, but there are lessons learned based on experience of different companies and countries, that can help guide the way for Egypt out of its dependency on imported downstream products and finally establish Egypt as an exporter of choice in the coming years.

Special thanks to Wael El-Serag and Economist Ahmed Kamel

the expert adds. Even large integrated oil firms make between 80% and 90% of their money from upstream, leaving downstream struggling to compete for attention and finances – a gap that can only be filled through deliberate national policies.

Downstream Economics and Strategic Input

Need for strategies are important everywhere in the developing world, even hydrocarbon-rich countries like Iran, to cite an Iranian expert, Ali Mirmohammad, Senior Consultant and Business Development Manager with Frost & Sullivan. The country repeatedly failed to translate its ample oil and gas reserves into a thriving petrochemical industry over a long period of time. Even when downstream became a priority for the Iranian regime, over the past 20 years, the industry still did not take off. It was not only sanctions that held back progress, he explained, but also inexperience, poor management, among other issues.

The economics of downstream may not be as profitable as upstream but the benefits in terms of value-added, job creation, and moving away from a dependency on oil are insurmountable, Mirmohammad insists. The longer you go along the value-chain the more

Entering a New Period of Uncertainty

«Upstream» and «downstream» are general business terms referring to a company's location in the supply chain. The closer to the end user a function or firm is, the further downstream it is said to be. Raw material extraction or production are elements of the supply chain considered to be upstream. The oil and gas supply chain is commonly referenced in this manner. The upstream companies identify oil and natural gas deposits and engage in the extraction of these resources from underground. These firms are often called exploration and production companies. Refiners represent the downstream element of the oil and gas supply chain. Downstream operations include refineries and marketing and commonly refers to the refining of petroleum crude oil and the processing and purifying of raw natural gas. The downstream sector touches consumers through products such as gasoline or petrol, kerosene, jet fuel, diesel oil, heating oil, fuel oils, lubricants, waxes, asphalt, natural gas, and liquefied petroleum gas (LPG) as well as hundreds of petrochemicals. Marketing services help move the finished products from energy companies to retailers or end users. Some of the products commonly associated with the Downstream sector include: Liquefied Petroleum Gas (LPG); Liquefied Natural Gas (LNG); Gasoline; Diesel Oil; Jet Fuel; Heating Oil; Other Fuel Oils; Propane; Asphalt; Synthetic; Rubber; Plastics; Petroleum Coke; Lubricants;

Pharmaceuticals; Antifreeze; Fertilizers; and Pesticides.

Investments in downstream in emerging markets generally carry higher risks than similar investments in developed countries. Factors related to emerging market operations that can threaten production or profitability for oil companies include infrastructure problems, labor problems and maintenance problems. Along with all the usual risks associated with any investment, operations in emerging markets are subject to specific additional risks. This is particularly true for oil companies, since they typically have large amounts of capital invested in their operations and also because they have to deal with a larger number of issues as compared to some other types of businesses.

One of the major problems for oil companies operating in emerging market nations is the lack of a highly developed infrastructure. Oil companies usually have to fund road, water and electricity access to drilling sites. This can require a much greater expenditure of time and money than it usually does in developed countries. Additionally, infrastructure maintenance tends to be unreliable and less well-established. An additional problem somewhat related to infrastructure problems may arise in the form of difficulties and extra expenses related to acquiring necessary equipment and replacement parts in a timely manner.

Potential labor problems include a lack

of skilled workers. Workers may have to be transported over long distances or housed at the operations site.

Legal and regulatory issues can be problematic as well. Oil companies have to negotiate a number of legal contracts and they must deal with government and local regulations. These issues are obviously more difficult to deal with in a country where the company is less familiar with the applicable laws and regulatory requirements. These issues can increase costs or even threaten to shut down operations.

Shipping costs, including tariffs and various import/export expenses, may increase overall operational costs significantly. Similarly, political uncertainty and foreign currency exchange risks are also inherent for any company doing business in a foreign country.

The downstream industry, on the other hand, follows a different business model. It's not as capital intensive as the upstream industry, and its operations work with variable costs. This kind of industry will surely show a much lower EBITDA (Earnings Before Interests, Tax, and Depreciation & Amortisation). However, operating profits may be just fine. This kind of industry also has another characteristic: it deals with a huge amount of money in transactions, and depends on how you handle these transactions, bottom line numbers can vary a lot.

Global Refining Industry: Winds of Change

The petroleum value chain can be divided into three sectors: upstream, midstream and downstream. Upstream and downstream activities all have a direct impact on refining activity and economics.

Crude Acquisition and Transportation:

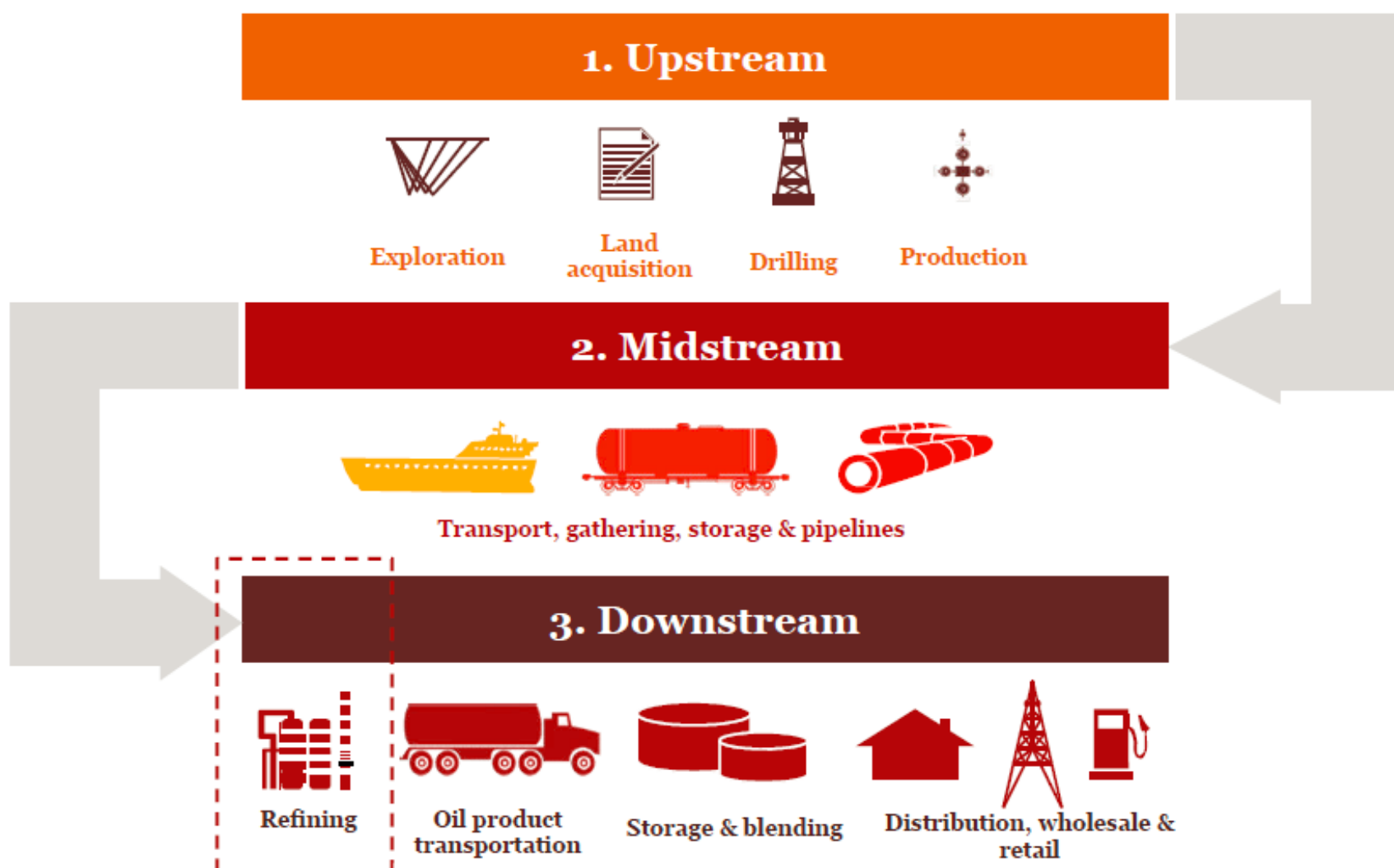
Crude is produced or purchased, and transported to the refinery gate. Crude oil can be transported by pipelines, cargoes, barges, rails and trucks. Pipelines and large cargoes are the most cost effective means of transport over very long distance, whereas barges, rails and trucks are used for shorter distance and for where pipelines or ships are not available.

Refining:

Crude oil and other feed stocks are distilled, converted and treated during the refining process to produce a range of petroleum products such as LPG, naphtha, gasoline, diesel, jet/kerosene, fuel oil, asphalt/bitumen, waxes, etc. These find end uses as transport fuels, power station fuels, heating & cooking oils, chemical feed stocks, road paving substances, etc.

Primary Distribution:

The various petroleum products are transported from the refinery storage / blending tanks via pipelines, road tankers, railcars, barges to storage tank terminals where product blending takes place to meet certain product speci-



cations (called 'rack blending'). Some products such as chemical feed stocks, fuel oil, and asphalt are delivered directly to industry customers.

Secondary Distribution:

Products are delivered to wholesale customers (e.g. jet fuel, gasoil) or retail customers (e.g. LPG, gasoline, diesel) via trucks. For transport fuel products (gasoline, diesel), small quantities of biofuels or unique additives can be added into the delivery trucks. Additives are used to make 'premium fuels', which increase engine performance, lifetime, clean combustion etc.

Retailing:

Retail fuel products are transported to petroleum service stations (i.e. forecourts) where commercial and private vehicles can be fuelled up. Many service stations also have other vehicle services (e.g. car wash, lube change) and convenience stores, food courts to accumulate additional earnings. Stations can be manned (staffed) or unmanned (self-serve).

With the exception of the US Gulf Coast, global refining fundamentals are currently weak

Global: With a couple of exceptions, the global refining industry is living through a sustained period of poor margins. This is driven by demand weakness and a continued supply overhang. On the demand side, sustained gasoline demand contraction in mature economies and weak growth in emerging markets, notably Asia are on-going. On the supply side, Europe and Asia are struggling to correct overcapacity, whilst the US demand contraction is resulting in increased length. Fundamentals are weak.

US West Coast: Current gasoline and distillate surplus is keeping refining utilisation and margins low. In addition, Canadian crude pipeline permitting delays and a much stronger industry response to the heavy coking margin weakness resulting in slower light tight oil (LTO) penetration than in other parts of the US.

North West Europe: A failure to close sufficient refining capacity is resulting in low margins. Margin downside pressures remain, including demand contraction (due to vehicle efficiency, biofuels and high oil price) as well as competition from imports from advantaged regions (notably Russia, ME and increasingly US).

US Gulf Coast: USGC is currently enjoying margin support from discounts in LTO (i.e. lower priced feedstock than USWC or NWE). Margins are strong. However, overall road fuel demand continues to decline.

Asia: Current margins are depressed by refining overcapacity and recent slow demand growth. Demand outlook is not as strong as over the last 10 years. The continued addition of high complexity new refining capacity is likely to result in a sustained capacity overhang. Demand Shifts towards Developing Economies

The global refining industry is currently undergoing significant fundamental shifts in both demand and capacity.

- Global oil product demand continues to grow but has shifted from developed economies (North America, Europe, Japan) to developing economies (Asia, Latin America, Middle East, Africa).
- Demand growth in developed regions remains stagnant or declining due to sluggish economic growth, high product prices, higher vehicle efficiency reducing consumption, and increased penetration of alternative fuels (biofuels, gas) and of electric vehicles.
- Growth in developing / emerging markets is still supported by economic and population growth, increased mobility and power needs, higher energy consumption per capita, and fuel subsidy programs; however signs of economic growth slowdown in countries such as China, India may impact short to medium term demand.
- Rising demand for gasoil/diesel will be the key growth driver with modest growth forecast for gasoline and other light end products (LPG, naphtha, gasoline, jet) while fuel oil consumption is expected to drop further.
- The shift to higher fuel quality standards worldwide in line with environmental regulations means the industry needs to meet the increased demand for higher quality products (e.g. lower sulphur), requiring additional capital investment and higher operating cost.

Capacity Shifting to Match Demand

- As consumption moves to new geographies, new capacity has been added to meet this growth, adding to refining overcapacity globally.
- Less advantaged refineries (lower efficiency, subscale, low complexity, more expensive feed stocks) are becoming more vulnerable to increased competition from more, and better advantaged export refineries.
- In particular, European refineries have struggled to compete with the influx of export refineries in the Middle East and Asia (e.g. India) for quite some time, and recently also from the US. This has resulted in poor margins and ongoing capacity closures / rationalisation in Europe, albeit at a slower pace than required.
- The focus in the future therefore will be addressing this refining overcapacity while rebalancing some product demand (i.e. more diesel and less gasoline).

Unconventional Oil and Further Changes in Market Dynamics are Forcing the Industry to Adapt

Unconventional oil in the US has had a significant impact on US liquids production:

- Trade flow and margin shift.
- The rapid growth in tight oil production, mainly in the US, and unconventional heavy oil sands production in Canada have had a profound impact on:
 - Global oil prices (e.g. widened WTI-Brent price differentials, narrowed light/heavy differentials).

- Global oil trade movement (e.g. displacing US crude imports from West Africa and Latin America, increasing possibility of US crude oil export).
- Product trade movement (e.g. more gasoline & diesel products exports from the US, European gasoline exports redirected to Africa and Latin America)
- Refinery margins (e.g. higher margins for US refiners at the expense of margins in Europe and Asia).
- Anticipated strong unconventional production growth in the future will continue to influence and challenge the refining industry globally, leading to further restructuring and rationalisation.

Crude supply mix continues to change:

- The proportion of crude oil that needs to be refined per barrel of incremental product continues to decline, as the total share of biofuels, GTLs, CTLs, NGLs and other non-crudes continues to rise, which present different product yields.
- Refiners will also need to continue to adapt to changes in crude supply sources, volume and quality (i.e. Light – heavy, sweet – sour) of the current supply outputs as well as other new crude streams coming on stream.

Developing economies are expected to account for all oil product demand growth in the future, offset by falling demand in developed economies in North America & Europe.

- Global oil product demand increased by 1.4 mbd (million barrels per day) in 2013, a strong rebound compared to the 2011 – 2012 growth levels and 10-year historical average.
- OPEC has projected global demand to grow from 89 mbd in 2012 to 108.5mbd in 2035, representing a growth of 0.9mbd or 0.9% per year.
- Developing economies are expected to account for all refined product demand growth to 2035, led by China and other Asia Pacific countries.

mand growth to 2035, led by China and other Asia Pacific countries.

- This expectation is being supported by the increased fuel demand in the transport and power sectors, fuelled by robust economic growth, fuel subsidies and rising energy consumption per capita.
- Declining product consumption in Europe, North America, and Japan is forecasted to continue due mainly to falling fuel demand for transport coupled with sluggish/negative economic growth.
- Ongoing reduced transport fuel consumption has been driven by vehicle fuel efficiency, increased use of hybrid and electric vehicles, and increased alternative fuels such as natural gas and biofuels.

Demand for Middle Distillates Is Likely To Drive the Majority Of Growth, Followed By Gasoline And Other Light End Products

- Demand for diesel/gasoil in the transport sector will be the key driver of growth globally out to 2035.
- Diesel/gasoil demand is expected to jump by >10mbd between 2012-2035, or >50% of total refined product growth in that period.
- This is fuelled by expansion in both commercial fleets (buses, trucks, light duty vehicles) and diesel passenger cars.
- Contributing to this growth are the changes in marine fuel quality specifications in 2015 and 2020 which will introduce significant shift of fuel oil usage into gasoil.
- Increased mobility and energy requirement will drive future demand for other light-end products such as LPG, gasoline/naphtha, jet fuel while demand for 'domestic' kerosene (used in lighting, heating, cooking) and fuel oil (used in power generation, fuelling ships) will fall.

Despite weak fundamentals, global refining capacity continues to expand, led by Asia Pacific and the Middle East.

- Global refining capacity increased by 1.4mbd in 2013, compared to 1.3mbd in 2012 and 0.4mbd in 2011
- 2013 capacity additions mainly took place in China and the Middle East, accounting for 0.7mbd and 0.6mbd of additions respectively.



- Smaller expansion has also been seen in Africa, Russia, and South America.
- Offsetting this development is the continued capacity contraction in Europe due to weak product demand, depressed margins and increased export competition from elsewhere.
- Nevertheless slower than expected demand and anticipated overcapacity in Asia has reigned in Chinese capacity growth, signalled by the postponement of some new

- refinery start-ups and expansion plans (e.g. Petrochina, BP in China).
- The global trend towards larger and more complex refineries has seen a reduction in number of refineries despite capacity growth. Future refinery capacity development is likely to reflect the demand shift from developed to developing regions.
- Refinery capacity outlook will continue to reflect the product demand shift, i.e. from mature markets to emerging economies where

- most if not all of product demand growth will take place.
- Prolonged low margin pressure will result in more European closures over the next few years, whereas continued capacity additions in Asia in a weak margin environment will force refiners to run at reduced rates or delay expansion projects.
- Accelerating production of unconventional oil (light tight oil in the US and oil sands Canada) will dramatically change the global crude trade flows, crude and oth-

er feedstock prices, which in turn have significant impact on product trade flows and prices. This will lead to further restructuring and relocation of the global refining sector.

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Protecting and Commercializing Petroleum Technology: Recent Developments in Intelligent Energy Law

By Hugh Fraser, Andrews Kurth

Intelligent Energy Law is a key element of the continuing progression of “Intelligent Energy” solutions and innovations. It can be defined as the strategic planning and application of international law and contracts to maximize investment returns on advanced technology and know-how through the creation, acquisition, commercialization and protection of intellectual property.

The Challenges and Drivers for Energy Technology

As we stand at the beginning of 2016, the challenges and drivers of energy technology are sharply in focus. A downward slide in oil prices from US\$115 to US\$28 in one year; high exploration and production costs; mature reservoirs; “difficult” petroleum - heavy oil, sour gas, and unconventional gas; reservoirs in ultra-deepwater and harsh environments; cyber security; and the impacts of global warming and climate change.

The industry has continually risen and responded to these challenges: key manifestations include game changing technologies such as horizontal drilling; hydraulic fracturing; advanced seismic technology; drillships, floating production, storage and offloading vessels (“FPSOs”) and remotely operated vehicles (“ROVs”); liquified natural gas (“LNG”) and floating LNG; subsea production systems; advanced completion and intervention tools; artificial lift and enhanced oil recovery; automation, advanced control systems and digital systems; and carbon capture, storage and utilization. This list is by no means complete.

Intelligent Energy Law

Intelligent Energy Law is a key element of the continuing progression of “Intelligent Energy” solutions and innovations. It can be defined as the strategic planning and application of international law and contracts to maximize investment returns on advanced technology and know-how through the creation, acquisition, commercialization and protection of intellectual property (IP) assets.

IP assets may have different definitional nuances in the United States (US), European Union (EU) and other jurisdictions but in an international energy context they will typically comprise trade secrets; patentable new inventions and improvements (including utility models); copyright (or similar rights) in the likes of engineering drawings, computer software, technical manuals and databases; industrial designs rights; and trade marks in brands and logos. Although it may be difficult if not impossible to put a dollar value on the component parts of a company’s IP assets, their combination, integration and deployment with the know-how of high value specialist personnel under strategically-minded leadership and results-driven management teams will comprise the lion’s share of a business’s corporate value and competitive edge.

Leaders and managers in the energy sector are focused on the maximization of the commercial benefits arising from IP assets while IP lawyers are focused on the successful creation, acquisition, commercialization and protection of IP assets in line with their clients’ goals and objectives. IP Assets can be created and acquired by

common law, statute, contract or registration; they can be commercialized by sale or licensing; and in some cases they need to be protected (or challenged) by litigation. However, the legal challenges associated with creating, acquiring, commercializing and protecting IP assets constantly evolve. The challenges can range from competition in ownerships claims, willful or unwitting IP infringements, poaching, industrial espionage, hacking, reverse engineering and the activities of patent “trolls” and these can all contribute to a form of corporate warfare where IP assets and their benefits are being fought over. Although one party may, ultimately, have clear line of sight on the valid legal entitlement to the prize in a particular case, the cost/benefit dynamics of enforcing its position may not be commercially justifiable, especially where protracted dispute resolution and uncertain enforcement processes are at play.

The international community is responding to these challenges and this is manifested in a complex inter-play of international organizations and their treaties and agreements and national legal regimes, highly developed in the US and EU and increasingly so in other key economies such as Brazil, China, Russia, India and the Gulf Co-operation Council (GCC) states in the Middle East, where much of the world’s petroleum reserves are located.

The World Intellectual Property Organization (WIPO)

The World Intellectual Property Organization (WIPO), founded in 1967 and based in Geneva, Switzerland, is “the global forum for intellectual property services, policy

and co-operation”. It is an agency of the United Nations (UN) that works with 188 member states, almost all of the 193 member nations of the UN. Its mission is “to lead the development of a balanced and effective international intellectual property system that enables innovation and creativity for the benefit of all”. Its mandate, governing bodies and procedures are set out in the WIPO Convention.

WIPO provides a range of international services for protecting intellectual property in multi-jurisdictions and resolving disputes outside national courts. The Patent Cooperation Treaty (PCT) permits applicants to file one international patent application thereby simultaneously seeking protection for an invention in 148 countries throughout the world (including the two most recent signatories, namely Iran and Saudi Arabia). The Madrid System is a one stop solution for registering and managing trademarks in the territories of up to 96 members. The Hague System for the International Registration of Industrial Designs permits an applicant to register up to 100 designs in over 64 territories through filing one single international application. The WIPO Arbitration and Mediation Center provides a forum to resolve internet domain name disputes without the need for court litigation, including the Uniform Domain Name Dispute Resolution Policy (UDRP), under which the WIPO Center has processed over 30,000 cases.

The World Trade Organization and the Agreement on Trade Related Aspects of Intellectual Property Rights

Also pivotal in the formulation of the inter-

national regulatory framework is the World Trade Organization (WTO) Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) launched in 1994 and also based in Geneva, following on from the General Agreement on Trade and Tariffs (GATT) which was initiated in 1948. The WTO is “the only global organization dealing with the rule of trade between nations. At its heart are the WTO Agreements, negotiated and signed by the bulk of the world’s trading nations and ratified by their parliaments. The goal is to help producers of goods and services, exporters, and importers to conduct their business”. Since November of this year it has 162 member countries.

TRIPS sets down the minimum standards for the different forms of IP protection which member nations must implement and enforce. The goal of TRIPS is “to ensure that the protection and enforcement of IP rights would contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations”.

The UN WIPO and WTO TRIPS initiatives are separate and distinct but they do need to be considered in tandem if a holistic strategic picture of the legal and commercial trends and the drivers of those trends are to be properly mapped. Of huge assistance is the WIPO Lex free global database which tracks the IP treaties and the laws of 195 countries against which the roll out of TRIPS may be measured.

International Energy Agency and the Bridge Scenario on Climate Change

A third major player is the International Energy Agency (IEA), established in 1974, in the wake of the “oil shock” which saw the oil price quadruple in the wake of the 1973 war in the Middle East. The IEA currently has 29 members including the US, Japan, most EU members, Korea, Australia, Canada, Turkey and Japan. The IEA is focused on its members’ interests in security of supply and research and analysis into reliable, affordable and clean energy dynamics; in some ways it serves as a counter balance to the Organization of Petroleum Exporting Countries (OPEC). However, as Bob Stembridge, senior IP Analyst at Thomson Reuters stated in the State of Innovation Report of 2015: “[...] the main activity that contributes to greenhouse gases is the combustion of fossil fuels, including coal, natural gas and oil, for transportation and energy. Yet governments continue to respond to pressures for cheaper energy in the short term, which everybody wants. When cheaper energy demands fracking for fuel under our feet or the Arctic pole, it becomes more and more difficult to keep a consensus on the way we find and use energy both today and in the longer term”. That report also quotes the U.S. Environmental Protection Agency’s sobering finding that global greenhouse gas emissions have risen by 35% since 1990. The IEA has issued its World Energy Outlook Special Report on Energy and Climate Change in June 2015 ahead of the 21st Conference of the Parties (COP21) being held in Paris in December 2015. The commitment of the world’s major players to Intended Nationally Determined Contributions (INDCs) at COP21 is seen as critical if the target of restricting global warming to

two degrees centigrade is to be achieved.

The IEA has proposed a “Bridge Scenario” which, it claims, could deliver a peak in energy-related emissions by 2020, relying solely on proven technologies and without changing economic development prospects of any region by virtue of five key initiatives: increased energy efficiency; the progressive reduction and phasing out of inefficient coal-fired power plants; phasing out fossil fuel subsidies by 2030; reducing methane emissions in oil and gas production; and increasing investment in renewable energy technologies from US\$270 million in 2014 to US\$400 billion in 2030. In the word of the IEA: “these measures have profound implications for the global energy mix, putting a brake on growth in oil and coal use within the next five years and further boosting renewables”. This lays down the gauntlet for the oil industry but stresses the dynamic opportunities for the gas sector and for those players focused on energy efficiency, methane reduction and capture, and renewables technologies. In the wake of COP21, the petroleum sector can expect radical legal and regulatory developments to allow the Bridge Scenario to be built and to cross the turbulent and troubled “waters” which lie below.

The United States of Innovation

Within the international framework set down by WIPO and TRIPS, a number of trends can be identified from the analysis of recent patent awards, IP litigation and legislative and policy initiatives in key jurisdictions. The WIPO IP facts and Figures 2014 Report identifies the scale of modern IP protection: there are 9.45 million patents, 2.29 million utility models, 26.3 million trade marks and 2.98 million industrial design rights in force as at the end of 2013. The US benefits most from this intangible asset pool with an estimated net international receipts (inward receipts less outward payments) of over US\$90 billion of royalties and fees.

The effects of recent litigation and patent reform efforts in the US have sought to counter speculation and concerns that the US could lose its global leadership in IP. The rapid rise of “patent trolls”, parties who acquire and maintain patent rights for the sole objective of seeking income, sparked new legislation in the US in 2011 to prohibit abusive use of what is effectively a government authorised monopoly right in technology. The America Invents Act of that year introduced a Patent Trials and Appeals Board which is authorized to receive a fast track and cost effective system for any party to challenge any claim of any US patent. Further legislative changes being mooted in the Innovation Act and Patent Act pending in the US Congress are: the shifting of fees so that the loser of a patent litigation generally will meet the costs of the winner; customer stay protections which would allow a manufacturer to protect its customers from direct infringement actions; increased pleading standards; limitations on the ability to use “shell” companies to front claims and enhanced powers for the Federal Trade Commission to take action against issuers of abusive demand letters. On the other hand, some commentators argue that these reforms will weaken the US patent system, which is fundamental to a large swathe of the US economy, and that more directly targeted action against the “trolls” is what is needed.

At this point it is very difficult to interpret litigation trends in the US. The number of patent actions filed in 2014 declined for the first time since 2009: there were 5,700 cases filed, which shows a decrease by 13% from 2013. From 2009-2013 the number of patent cases filed grew to 24%. The decline in 2014 may be influenced by the 2014 Supreme Court case *Alice Corp. v. CLS Bank*, which limited the ability to obtain and assert software patents. However, litigation rates in the early months of 2015 were high, which increases doubts that the case will have substantial long-term effects on litigation numbers. There has long been a very high correlation between patents granted and patent cases filed. The number of patents granted grew by 14% last year even as litigation declined. Despite this discrepancy, the correlation remains very high.

There is other evidence to suggest that the US has little to fear in losing its IP crown, at least in the short term. The WIPO IP Facts and Figures 2014 Report found that of the 9.45 million patents in force, 26% were in the USA, followed by Japan with 19%. China for the first time has crossed the threshold of one million patents and 85% of the 2.29 million utility models 85% were attributable to China. The 2014 Report of the Director General to the WIPO Assemblies reported that of the 205,300 PCT patent applications in 2013, the USA accounted for 57,239 with Japan following at 43,918. China was well back in third place with 21,516 but had overtaken Germany with 17,927. Korea took fifth place with 12,386 ahead of France with 7,899. The remaining Top 10 nations were the United Kingdom (UK), Switzerland, Netherlands and Sweden, all with under 5,000 PCT applications.

The US can also take comfort that of Thomson Reuters’s Top 100 Global Innovators of 2014, 35% are US companies, although Japan has 39%; Europe (dominated by France, Switzerland and Germany) has 18%; and the rest of the world has only 8% including only one Chinese company, Huawei. Sadly, the UK and Norway are not represented, which is surprising considering the North Sea oil and gas industry’s reputation for innovation in subsea technology, and particularly the likes of Shell and Statoil’s patent performances. If Thomson Reuters’s results are to be accepted, then the conclusion has to be that, while China and South Korea score highly in the quantitative scoreboard, it remains the US, Japan and Europe which has the highest qualitative marks for the meantime.

The Rise of China

While the perception of US technology and investment in IP is secure in global terms, China remains, to some, a hotbed of disrespect for IP. However, according to the Thomson Reuters’s State of Innovation Report of 2015, in an energy context, there were 24,158 patents awarded to the oil and gas sector in 2014. China beat the pack and has made extremely impressive strides in its patent awards: three of the top five patent grantees were Sinopec with 1946 new patents, followed by PetroChina with 1520, and China National Offshore Oilfield Corporation with 384; the USA’s Halliburton (783) and Schlumberger (448) were in third and fourth place. According to Thomson Reuters’s research: “Sinopec innovation is focused downstream on everything from crude oil fractionation and cracking to produce heavy oil/diesel fractions to synthesis of petrochemicals such as polymers, aro-

matic compounds, alcohols, aldehydes, and acids. Similarly, PetroChina is focused upstream on the discovery, exploration, drilling, extraction, well-head processing, and pipeline technologies. Whether up- or down- stream, they are in the business of navigating both streams to get the most out of the natural resources far below”.

The key legal developments in China were highlighted in the Chinese State Council’s “Action for Deepening the Implementation of National IP Strategies” issued in December 2014. This report highlights the objectives and methodologies for building China’s intellectual property assets in the five years to 2020. These include new rights for employees who generate new patented inventions for their employers, a new trademark law and the establishment of specialized IP courts. Indeed, it was a major landmark when WIPO opened its Chinese office in Beijing in July 2014. In addition to the three million or so Chinese patents and utility models in existence, 7.2 million of the world’s 26.3 million trademarks are Chinese, as are 1.2 million of the global three million registered industrial designs. If criticisms remain of the Chinese approach to foreign IP, their commitment to investment in their indigenous IP is very clear.

The United Courts of Europe

Meanwhile, in the European Union (EU), the introduction of an Agreement on the Unified Patent Court (the UPC Agreement”) seeks to maintain Europe’s competitive position in IP by creating a Unified Patent Court (UPC) which will have exclusive jurisdiction for litigation relating to European patents. The UPC will comprise a Court of First Instance, a Court of Appeal and a Registry. The Court of First Instance will have a central division with its seat in Paris, two sections in London and Munich, and local and regional divisions in EU member states. A Court of Appeal will be located in Luxembourg. The UPC initiative is set to address a current system where national courts and authorities of the contracting states of the European Patent Convention decide on the infringement and validity of European patents. This generates a lack of consistency in approach in terms of damages awards, costs, timelines and predictability of legal cases.

By way of explanation, the European Patent Convention of 1973 (EPC) introduced the European Patent Organization, the European Patents Office and the concept of European patents, obtainable under a harmonized process via a single patent application at the European Patent Office in Munich (or one of its branches). A European patent may be obtained directly under the EPC system or via a PCT application, with the PCT application entering a European regional phase during which the European procedural steps are applied. Indeed, twelve EPC contracting states including France and the Netherlands have closed off their national patent route via the PCT system, meaning that a PCT applicant must use the European phase and obtain a European patent to secure patent protection in their territory. The most recent state to adopt this stance was Lithuania in September 2014.

The UPC Agreement was signed by 25 EU Member States on 19 February 2013. It will need to be ratified by at least 13 states, including France, Germany and the UK to enter into force. All the signatory states

have committed to establish the new court and a preparatory committee under the presidency of Paul Van Beukering of the Netherlands is currently at work on five major workstreams for the establishment of the UPC: the legal framework, financial aspects, information technology, facilities and human resources. However, this is by no means a fast track process and a transitional period of seven years during which parties will have the right to opt out of the UPC system is currently envisaged. Could this be another disappointing sign that legal systems struggle to keep pace with the rate of innovation and that Europe's multi-state processes serve as a handicap in the global IP race?

The State of Global Petroleum Innovation

Perhaps the biggest headline drawn from the State of Innovation Report 2015 was not whether China can supplant the US as petroleum IP king or whether Europe is in long term IP decline, but the laggard performance of the oil and gas sector against its peer groups. The report found that the 24,158 oil and gas sector patents in 2014 comprised only 2% of all patent awards: this was the lowest but one industrial sector of the 12 sectors reviewed, and lagged far behind the 380,325 information technology patents (30%), 161,739 telecommunication patents (13%) and 153,872 patents in the automotive sector (12%). In the same context, Jack Spath, the President of the Society of Petroleum Engineers in 2014, reminded the petroleum technology community in his closing address at the Annual Technology Conference and Exhibition

in Amsterdam in October 2014 that the petroleum industry has one of the lowest percentages of investment in research and development relative to gross revenues.

Topically, the Middle East region hosts some of the driving forces seeking to redress this shortfall. As "low tech, easy oil" fades from memory, the emphasis is on technology transfer, in-country value and investment in know-how and training. Saudi Aramco was awarded 99 patents in 2014 and has a ring of technology offices in key strategic locations including Houston and Aberdeen. Saudi Arabia is home to the GCC Patents Office, offering a European style multi-territory patent filing system for Saudi Arabia, the United Arab Emirates, Oman, Kuwait, Qatar and Bahrain. The United Arab Emirates was recognised in the Global Innovation Index of 2014 as a leading player in technology joint ventures and the country is host to the International Renewable Energy Agency and the MASDAR future energy initiative, both being core components of the Abu Dhabi 2030 strategic vision for the economy. Qatar was also recognised in that index for the level of enrolment in its universities; and Oman has turned around a seemingly unrelenting reduction in oil production to return to almost 1 million barrels per day production and is recognised as a leading global player in the deployment of enhanced oil recovery techniques. Finally, Iran's pending return to the international petroleum market will add a new dynamic to technology transfer and indigenous innovation in the region.

Aside from China, the other BRIC countries of Brazil, Russia and India have not yet

emerged with major scores on the petroleum innovation board despite accounting for 22% of the world's 7.4 billion population, 16% of global oil production and 18% of natural gas production. Brazil's ongoing opportunities in the deepwater, Russia's Arctic petroleum future and India's sheer scale of projected energy demand growth all indicate that their involvement and contribution to petroleum technology development must surely expand materially. However, extremely low shares of patent awards are currently recorded by Africa and Latin America and this indicates a long haul to a distant horizon in these cases.

A Strategic Approach to Intelligent Energy Law

So, in the context of the current trajectory of technology driver trends, the WIPO/TRIPS legal framework, the climate change challenges and the relative state of innovation in the global petroleum sector and other industries, how can a strategic approach to intelligent energy law be deployed as part of a business's competitive edge? There are, perhaps, four key elements:

Firstly, the widening out of the "internationalization" process means that the creation, acquisition, commercialization and protection of intellectual assets must be planned and implemented with a global perspective and with full awareness of the prevailing laws in all applicable locations, including those emerging territories where future revenue streams can be anticipated – thinking and acting locally or regionally no longer works.

Second, an integrated management information system must be in place to iden-

tify, capture and protect new intellectual property assets being created within an organization, to register and map out the business's IP assets in an auditable format, and to monitor third party infringements.

Third, tailored contractual arrangements confirming ownership and commercialization rights must be in place with all key parties with whom the business interfaces: including clients, joint venture partners, suppliers, employees and consultants. These contracts must be fit for purpose, especially where complex international jurisdictional and enforcement challenges will arise in the events of disputes.

Fourth, a market intelligence system must be in place to track the arrivals of new competing or synergetic technologies within the energy sector; and technologies in other sectors which may be capable of migration to the petroleum sector; and special emphasis must be placed on developing or identifying acquirable technologies which contribute to energy efficiency, emissions reductions and cost reduction/affordable energy.

There is certainly no copyright in the optimum methodology and execution strategy for rolling out any business's Intelligent Energy Law competitive edge positioning but if the above four pillars of strength are in place then the chances of a successful commercial and risk-managed approach will be enhanced significantly.

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Petrozenima Muzhil Field Development

South Abu Zenima Petroleum Company (Petrozenima) has been established as a joint venture company between Egyptian General Petroleum Corporation (EGPC) and National Petroleum Company (NPC) to carry out Muzhil Field Development in South Abu Zenima Concession.

A comprehensive plan for the project execution was set to include both Platform and ground facilities to be tied in with SUCO Ras Badran facilities. The facilities will be connected with 2 X 10 inch line of total 13 km length, each.

Eight wells have been drilled in Petrozenima concession by using mud line suspension system and temporarily abandoned after achieving an oil discovery with an estimated oil reserve of around 7 mmbbl (2P).

For the field development purpose, platform engineering designs have been finalized, and Petrojet has been awarded to manufacture the Platform. 98% of the Platform materials procurement have been finalized and fabrication started at Petrojet Yard in Maadia, Alexandria.

The platform manufacturing was suspended by the end of 2008, and by June 2012 EGPC had withdrawn the development concession in South Abu Zenima area, and suspended the activity; however, in February 2014, a settlement between EGPC and NPC has been made to reestablish Petrozenima to complete the project.

Based on new technical and economical studies, and in order to meet first oil of Muzhil field, the project development plan has been changed to be a simple Platform and Mobile Offshore production Unit (MOPU) in addition to

Floating Storage and Offloading unit (FSO) linked by 4 inch diameter marine line, as well as cancelling the offshore /onshore pipelines and the onshore facilities.

Continuous efforts are being exerted to achieve the required strategy. The most important achievements since the company Board reformation on 10th April 2014 are: Platform fabrication and installation; securing offshore rig and tie back material; and MOPU/FSO tender awarding.

Efforts are exerted to complete wells tie back (Muzhil 1,2) with the Platform through farming in contract for Rig ADMARINE-3 from General Petroleum Company (GPC) and purchasing necessary materials. Tie backs for well 1 & 2 for production and purchasing jet pumps equipment to enhance production and water injection plan in Muzhil-8 to sustain reservoir pressure

and secure production rates through artificial lifts.

The process includes working on importing and installing the Jet Pump with the HPs to secure oil production rates. The cost of development during the first fiscal year of 2014/2015 alone is \$17m; in addition to \$90m from previous expenditure.

On the 1st of January 2016, daily production rate is expected to be 3000 b/d. On later stage and upon reservoir performance evaluation, additional one or two wells are planned to be completed to increase the production rate up to ± 4000 bopd.

Petrozenima's Top Management extends special thanks and appreciation to shareholders and employees for their exerted efforts hoping to sustain mutual cooperation to achieve the targeted plan.



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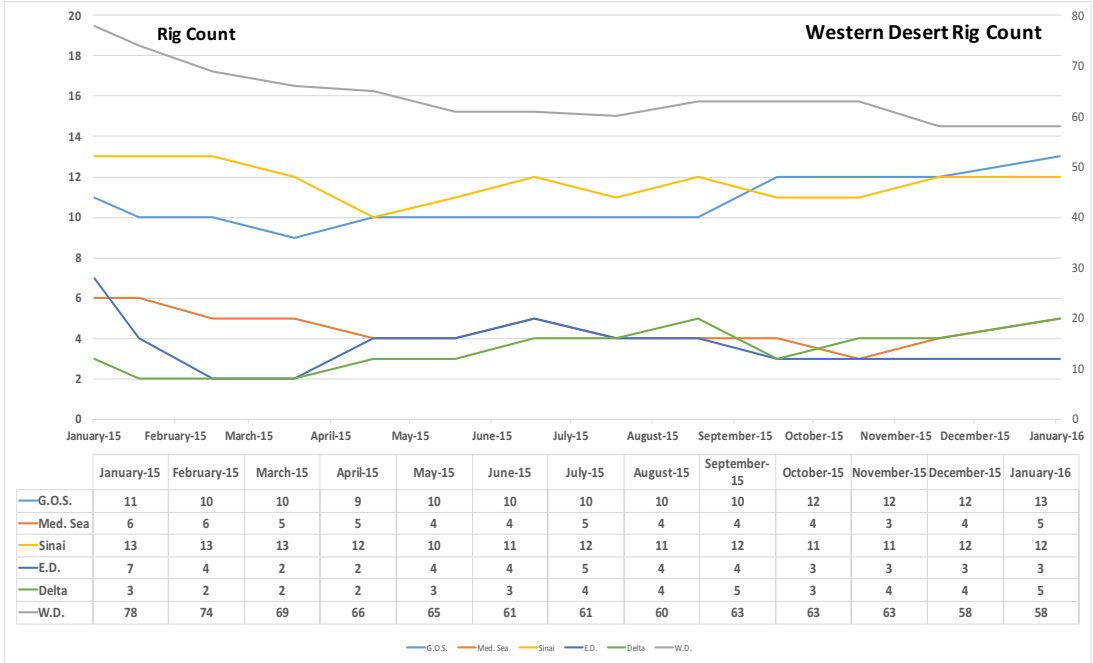


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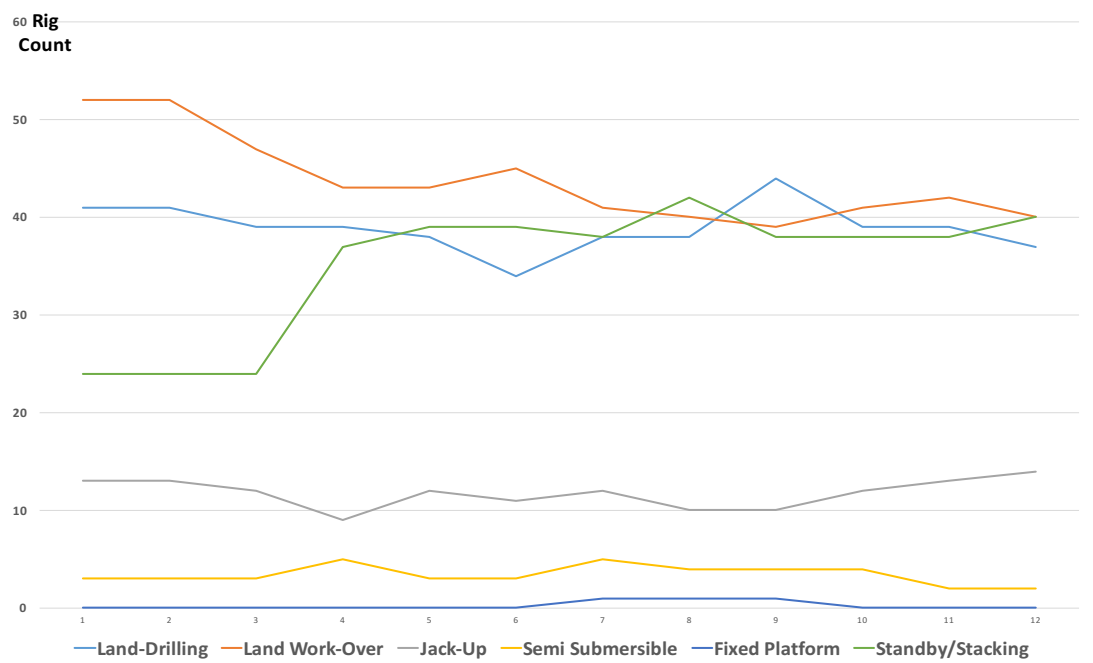
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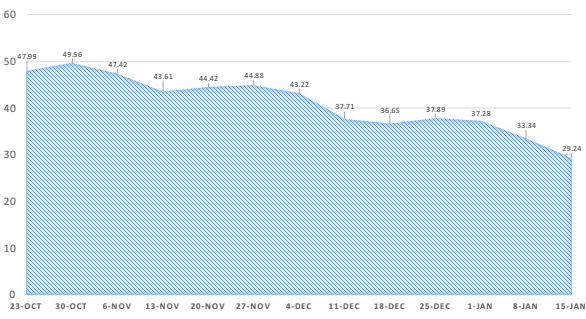
Changes in Rigs by Location - January 2015 to January 2016



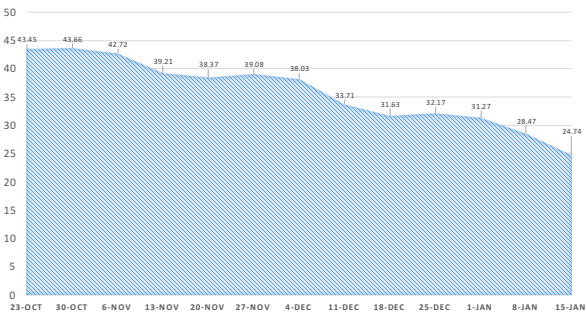
Changes in Rigs by Type - January 2015 to January 2016



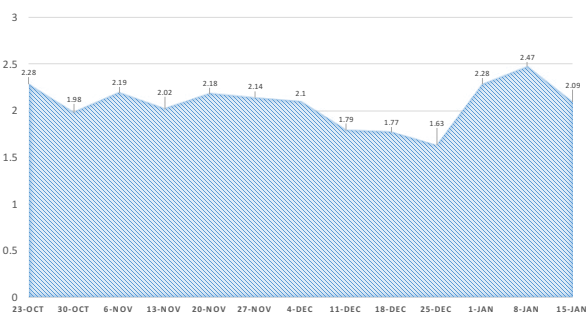
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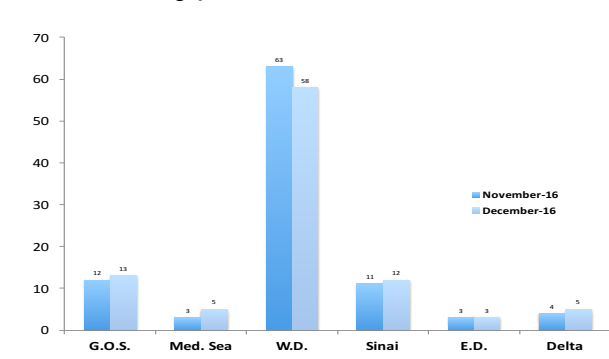


Production - December 2015

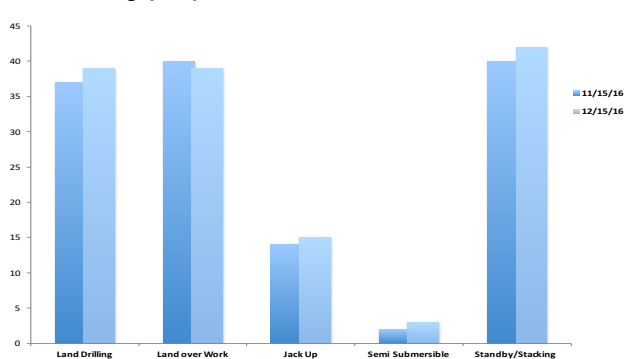
	Equivalent Gas	Condensate	Liquefied Gas
Med. Sea	11436786	258863	706503
E.D.	29643	4575	2142
W.D.	7521250	819766	1556971
GOS	612857	253852	80310
Delta	2900893	131075	206980
Sinai	3571	50265	26515
Total	22505000	1518396	2579421

Unit: Barrel

Rigs per Area - November-December 2015



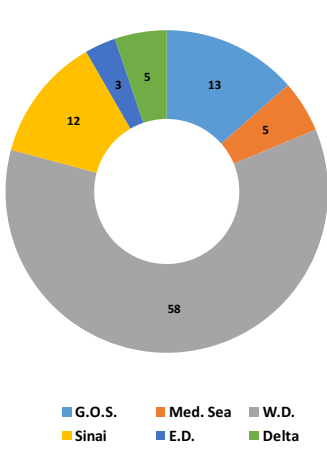
Rigs per Specification - November - December 2015



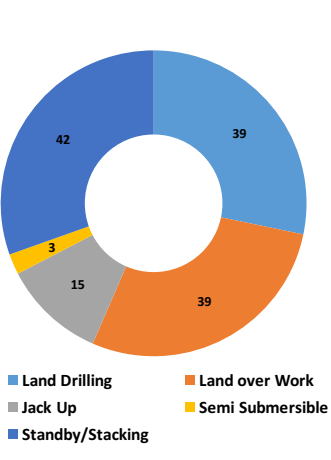
Rigs per Specification - January 2016

Location	Nov. 2015	Dec. 2015
Land Drilling	37	39
Land over Work	40	39
Jack Up	14	15
Semi Submersible	2	3
Standby/Stacking	40	42
Total	133	138

Rig Count per Area - January 2016



Rigs per Specification - January 2016



Rig Count per Area - January 2016

Location	Nov. 2015	Dec. 2015
G.O.S.	12	13
Med. Sea	3	5
W.D.	63	58
Sinai	11	12
E.D.	3	3
Delta	4	5
Total	96	96

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