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2021

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Petroleum Today

COUNTRY FOCUS:INTEREST REMAINS HIGH IN EGYPT'S GAS SECTOR

LNG CONDENSED

◆ TALENT & TECHNOLOGY ◆ INDUSTRY AT A GLANCE ◆ TECHNOLOGY APPLICATIONS

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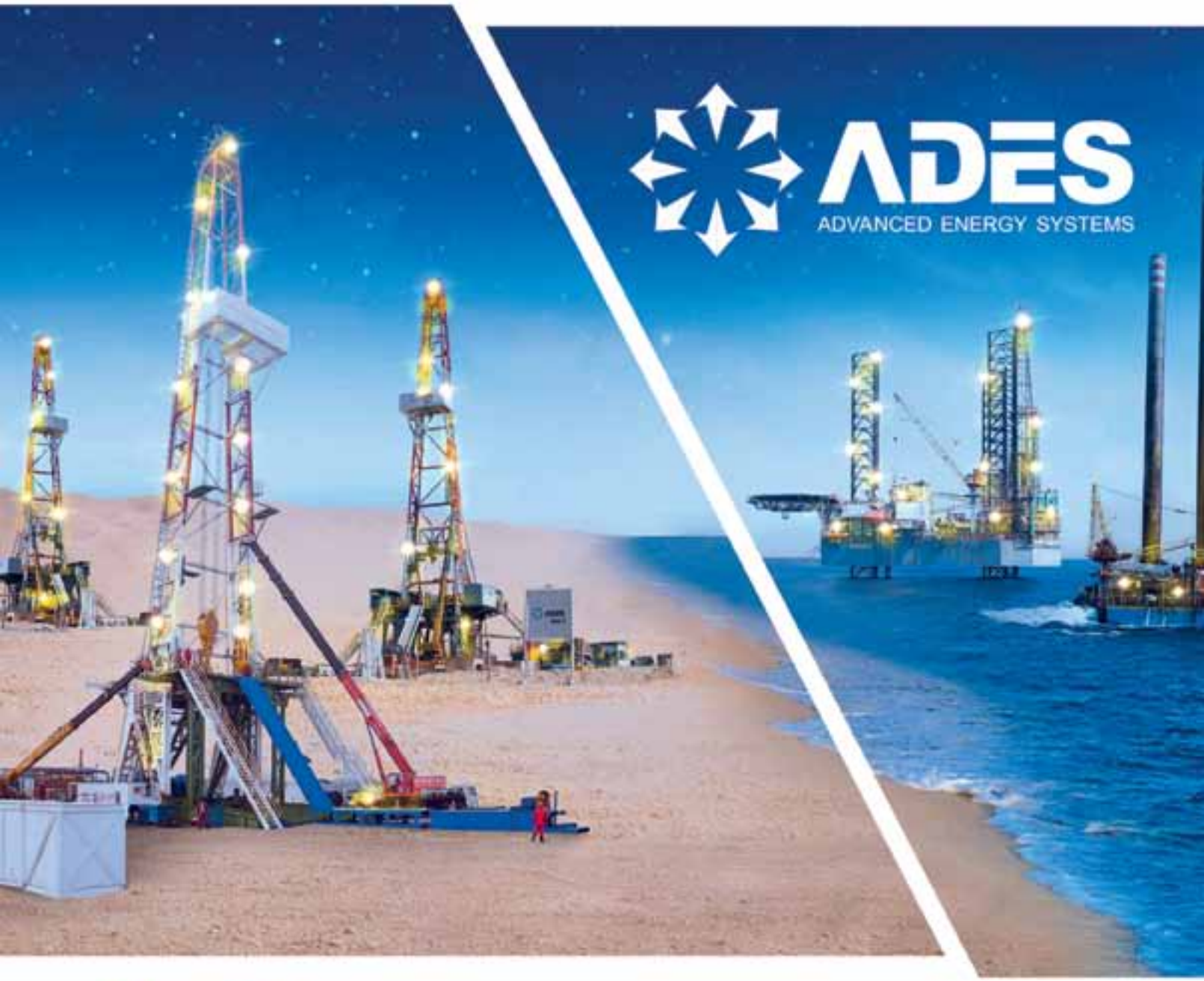

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We are accredited by the ILAC, based on the international mutual recognition arrangements (MRA), under the guidelines of ISO/IEC 17025 for general requirements for competence of calibration and testing laboratories. We are certified API Q2, ISO 9001, ISO 45001 and ISO 14001.The ILAC is the peak international authority on laboratory accreditation. Laboratory accreditation provides our clients with formal recognition of the competence of our laboratory. We are re-evaluated regularly by the accreditation body to ensure our continued compliance with requirements. Thus, being accredited is highly regarded both nationally and internationally as reliable indication of our technical competence. Accordingly our data is readily accepted overseas.

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- Flange break register during shutdown and maintenance

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Petroleum Today

contents

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Egypt's Downstream Challenges and Development

Egypt's oil and gas downstream shows an expectation to grow at a CAGR (Compound Annual Growth Rate) of more than 5% during the forecast period. Factors such as supportive government policies, efforts to grow the downstream sector coupled with upcoming projects, are expected to drive the market studied.

The Petrochemical Industry is looking to expand significantly with 11 new projects with total investments estimated at $19 billion. The new strategy adopted by Egypt will be developed and implemented through to the year 2035.

When faced with a downturn and/or increased competition companies look to review capital-intensive sectors and give priority to rational operational cost reduction and risk optimization.

Asset management is brought to the forefront of priorities, grounded by the structure and degree of depreciation of production facilities in the region.

Human resources have long been a key area for industry development in the region there is an available pool of potential human resource and investments have been made in education and training.

Other areas for industry efficiency increase relate to infrastructure development pipeline and port construction, more gas-fired electricity generation units, unconventional gas projects, local supplier development and independent power producers, methanol, urea and fertilizers production for local use.

All of this clearly illustrates the willingness and drive to grow and further develop the Egyptian Downstream industry in 2021.

In the end, greetings to you, Egypt has pride and dignity

Petroleum Today

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EGYPT NEWS

Wintershall Dea to Drill 3 New Wells in East Damanhur Block

During its ANNUAL PRESS CONFERENCE 2021, Paul Smith, wintershall dea CFO told Petroleum Today Magazine about the updates in the development plan of East Damanhur block: "As for East Damanhur block we were awarded 100% and then went down to 40%, and we expect to drill 3 exploration wells in the block." we already have an existing development in Desouk and of course we was looking for exploration opportunities." He added.

The Turboden helps decarbonise GASCO compressor stations in Egypt

Turboden S.p.A., part of Mitsubishi Heavy Industries, has received an order for two sets of 14 MW binary cycle power generation equipment, which will be used as part of a gas compression system to improve the efficiency of the GASCO Dahshour gas compression station in Egypt. Egyptian Natural Gas Company (GASCO) will install the gas compression system that includes the power generation equipment, which will generate 28 MW of power using the waste heat from four existing gas turbines. Siemens Energy will also supply an additional gas turbine and 20 MW electric-motor-driven compressors to the system. The new configuration will improve the system's compressed gas capacity and overall efficiency to improve CO2 emissions. In addition to creating 192 GW of power per annum, the configuration will conserve more than 2.3 Bcfy (65 X 106 m3/y) of natural gas. The system will also reduce 120,000 t/y of CO2 equivalent.

Egyptian Petroleum Product Imports Drop 32.3%

Egyptian petroleum product imports amounted to $6.383bn during 2020, the Central Agency for Public Mobilization and Statistics (CAPMAS) revealed. It reflected a 32.3% decrease on the previous year, when the value came in at $9.429bn.CAPMAS said that diesel saw the largest decrease in 2020, of $858m compared to $3815m in 2019. It was followed by 95 octane petrol, which amounted to $609m in 2020 compared to $1,487m in 2019, and LPG which reached $840m compared to $ 1053m

Europe to receive 1st Egyptian liquefied natural gas shipment

Egypt plans to export its first shipment of liquefied natural gas (LNG) from a facility in Damietta to Europe, Spokesman for the Petroleum Ministry Hamdy Abdel-Aziz told MENA on Sunday.The LNG Tanker Golar Glacier has arrived in Damietta port to ship the first experimental shipment from the facility that has been idle for eight years.The return of Damietta's facility and the country's other plant, Idku — whose exports have picked up after dropping last year amid the coronavirus pandemic — will mark the revival of Egypt's LNG push.Egypt plans to use its position on Europe's doorstep to become a major supplier to the continent, which is transitioning away from dirtier fossil fuels such as oil and coal.The country will become one of the top 10 LNG exporters once it reaches full capacity, according to data compiled by Bloomberg.

Egypt Plans $179m Boost for National Gas Network

Egypt is planning to invest 2.8 billion Egyptian pounds ($179 million) in its natural gas network this year. authorities plan to operate about four new lines with a total length of more than 180 kilometers. The upgrades will also aid the ministry's plan for Egypt to become an energy hub in the MENA region.At the end of 2019, Egypt's petroleum minister announced a plan to increase the length of the national gas network by about 1,000 kilometers within four years, with the aim of increasing capacity to accommodate new gas discoveries. Sources said that the natural gas network upgrades are being completed on schedule.

Egypt cooperates with Belgian "DEME" to start producing, exporting green hydrogen

Ministries of Electricity and Petroleum and the Navy signed a cooperation agreement with the Belgian «DEME» company to start special studies for producing «green hydrogen» and exporting it from Egypt. The agreement was signed by Gaber El Desouky, Chairman of the Egyptian Electricity Holding Company, and Alan Bernard, Chairman of the Board of Directors of «DEME». Egypt's Prime Minister Mostafa Madbouli, who witnessed the signing ceremony, emphasized that the signing of this agreement comes within the framework of the implementation of the state's strategy that aims to expand in the areas of clean and green energy, and increase the share of renewable energy in the electric energy mix.For his part, the Chairman of the Board of Directors of the Belgian company, «DEME», indicated that the project comes within the framework of the Kingdom›s pledges to implement the «Green Agreement», as it is one of the member states of the European Union, and from this standpoint the company sought to choose the best sites that are suitable for establishing pivotal centers for producing Green hydrogen.

ARAB & INTERNATIONAL NEWS

Kuwaiti firms grabbed $8.25bln share in downstream projects

Kuwaiti companies grabbed contracts worth more than 2.5 billion Kuwaiti dinars ($8.25 billion) as part of three major downstream projects awarded by country over the past few years, an oil official has said. The projects comprise the 615,000-bpd Al-Zour oil refinery in South Kuwait, the Clean Fuel Project for upgrading Kuwait's refineries and gas import facilities, said Walid Al-Badr, CEO of the state-owned Kuwait National Petroleum Company. Quoted by the Kuwaiti Arabic language daily Alanba on Thursday, Badr said local firms were awarded deals worth around 1.047 billion dinars ($3.45 billion) in Al-Zour project and nearly 1.3 billion dinars ($4.29) in the CFP contract. They also benefited in sub-contracts in the gas facilities project, he added. He noted that CFP, involving Mina Al-Ahmadi and Mina Abdullah refineries, has almost been fully commissioned while nearly 98 percent of Al-Zour and gas facilities projects have been executed.

Iraq's oil exports rise to 2.96mln bpd in February – oil ministry

Iraqi oil exports rose to 2.96 million barrels per day (bpd) in February from 2.868 million bpd the previous month, the Oil Ministry said. Exports from Iraq's southern Basra terminals reached 2.825 million bpd in February, up from 2.77 million bpd the month before, the ministry added.

Largest LNG Project Ever: Qatar Petroleum Sanctions North Field East Project

Qatar Petroleum announced that it will start developing the North Field East (NFE), which is the world's largest liquefied natural gas (LNG) project. The project will raise the state's LNG production capacity from 77 million tons per year (mmt/y) to 110 mmt/y. This announcement came during the signing ceremony for celebrating the implementation of engineering, procurement and construction (EPC) contract of the project. The contact was signed between the Minister of State for Energy Affairs and QP' CEO, Saad Sherida Al-Kaabi, CEO of Chyioda Corporation, Kazushi Okawa, and the President of Technip Energies, Arnaud Pieton. The agreement stipulates the construction of four mega LNG trains with capacity of 8 mmt/y for each one in addition to gas treatment facilities, natural gas liquids recovery, as well as helium extraction and refining within Ras Laffan Industrial City. According to the statement, the project is expected to start production in Q4 2025, raising the total production to 1.4 million barrels of oil equivalent per day. On this occasion, Al-Kaabi said that "The total cost of the NFE project will be $28.75 billion, making it one of the energy industry's largest investments in the past few years, in addition to being the largest LNG capacity addition ever, and the most competitive LNG project in the world. This project will generate substantial revenues for the state of Qatar and will have significant benefits to all sectors of the Qatari economy during the construction phase and beyond."

OPEC+ extends most oil output cuts into April, Saudi keeps voluntary curb

OPEC and its allies agreed to extend most oil output cuts into April, offering small exemptions to Russia and Kazakhstan, after deciding that the demand recovery from the coronavirus pandemic was still fragile despite a recent oil price rally. OPEC's leader Saudi Arabia said it would extend its voluntary oil output cut of 1 million barrels per day (bpd), and would decide in coming months when to gradually phase it out. The news pushed oil prices back towards their highest levels in more than a year with Brent trading up 5% above $67 a barrel as the market had expected OPEC+ to release more barrels. OPEC+ had cut output by a record 9.7 million bpd last year as demand collapsed due to the pandemic. As of March, it is still withholding about 7 million bpd, or 7% of world demand. The voluntary Saudi cut brings the total to about 8 million

bpd. Under Thursday's deal, Russia was allowed to raise output by 130,000 bpd in April and Kazakhstan by another 20,000 bpd to meet domestic needs.

China To Cut Energy Intensity By 3% This Year

China will reduce the amount of energy it uses to expand its economy by 3 percent this year as part of efforts to hit emission reduction targets set earlier, Reuters reports, citing a statement by Premier Li Keqiang. China is the world's biggest single emitter, accounting for 28.8 percent of global carbon dioxide emissions in 2019. It is also one of the fastest-growing economies globally, consuming a lot of energy in the process—what's called energy intensity. Last year, because of the pandemic, emissions fell, but only temporarily. To assure the rest of the world that it is no enemy to emission cuts, Beijing announced plans to achieve net-zero status by 2060. China would increase its installed solar and wind capacity to more than 1,200 GW by 2030, boosting the share of non-fossil fuels in its energy mix to a quarter of the total, President Xi Jinping said last December. This is up from an earlier target of 20 percent for renewables in China's energy mix. For context, at the end of 2019, renewables accounted for 15.2 percent of the country's energy mix.

India's Largest Refiner To Invest $4.5 Billion To Boost Capacity

Indian Oil Corporation (IOC), the country's biggest refiner and fuel retailer, plans to invest US$4.46 billion (329.46 billion Indian rupees) to expand the processing capacity of its Panipat refinery by two-thirds to 500,000 bpd within three years.The refinery expansion project is set to boost petrochemicals production at the site, as well as specialty products that would contribute to de-risking "the conventional fuel business of the company," Reuters quoted IOC as saying in a statement.Petrochemicals are expected to contribute the most to global oil demand growth this decade, replacing road transportation fuel as the key driver of growth. India, the third-largest importer of crude oil in the world and the third-largest consumer of oil, plans to significantly boost

its overall refining capacity this decade.Last year, India's Oil Minister Dharmendra Pradhan said that the country planned to double its refining capacity by 2030 from the current 5 million barrels per day (bpd).

CORPORATE NEWS

Chevron to build a carbon capture plant with Microsoft, Schlumberger

Chevron Corp is partnering with Microsoft Corp, oilfield services firm Schlumberger NV and privately held Clean Energy Systems to build a carbon capture plant in California, as the U.S. oil major expands investments in renewable technology. Chevron said the plant will convert agricultural biomass to electricity, and almost all the carbon captured in the conversion of agricultural waste would be stored underground. The venture adds weight to plans outlined by California's Air Resources Control Board last month to start phasing out all agricultural waste burning in the valley by 2025. Once completed, the companies expect the plant will use about 200,000 tons of agricultural waste and remove around 300,000 tons of carbon dioxide

every year. the scheduled repayment of the debt in June 2019 and will continue to repay the balance of the loan out of cash flow generated from its operations, Sumitomo said in a statement.

Shell Says Its Oil Production Has Begun a Long Term Decline

Royal Dutch Shell Plc said its carbon emissions and oil production have peaked and will decline in the coming years as the company laid out a detailed plan for its transition to cleaner energy. Shell said its oil production will fall by 1% to 2% a year. Assuming an annual reduction on the upper end of that range, the oil major's production would fall by 18% by the end of the decade. Output of "traditional fuels" will be 55% lower by 2030. In a wide-ranging strategy update published on Thursday, the Anglo-Dutch company set new targets for electric-car charging, carbon capture and storage, and electricity sales. It also sought to reassure investors that it could maintain returns through the energy transition, reiterating its pledge for an annual dividend increase of about 4% and the resumption of share buybacks once its net-debt target has been achieved.

ExxonMobil to cut 7% of Singapore workforce amid 'unprecedented market conditions'

ExxonMobil Corporation plans to cut its workforce in Singapore, home to its largest oil refining and petrochemical complex, by about 7% amid the "unprecedented market conditions" resulting from the COVID-19 pandemic. About 300 positions out of 4,000 current jobs will be impacted by the end of 2021, the company said in a statement. Exxon Mobil's Singapore complex has the capacity to refine about 592,000 barrels per day of oil and includes its biggest integrated petrochemical production site.

Wintershall Dea, Strong Performance Despite Difficult Environment

In a challenging market environment, Wintershall Dea ended the 2020 fiscal year with strong operational momentum in the fourth quarter. In the fourth quarter of 2020, Europe's leading independent gas and oil company increased its production to more than 650,000 barrels of oil equivalent per day (boe/d) – the highest level so far since the company's merger two years ago. The company expects to increase its production in 2021 (620,000 to 640,000 boe/d) and to invest €1.0 to 1.1 billion in production and development (capex), which is slightly below the previous year's level. Exploration expenditure is expected at €200 to 250 million, a slight increase on 2020 (€154 million).

Aramco Seeks One-year Extension on $10bln Loan

Saudi Aramco has asked banks to extend by a year a $10 billion loan it raised last May, suggesting that rebounding crude prices are not pushing the oil giant to reduce debt for the time being. It is at the banks' discretion whether to extend the loan, but lenders will likely agree in order to maintain a good relationship with Aramco in the hope of receiving future business, LPC said citing a banker. Sources told Reuters last year that Aramco would use the loan to back its acquisition of a 70% stake in Saudi Basic Industries Corp (SABIC) from Saudi Arabia's Public Investment Fund, a deal worth almost $70 billion.

Metal-seated ball valve is a revolutionary seat design

[Fig (1) Crane company Metal-seated ball valve]

Crane ChemPharma& Energy, a Crane Co. business, has announced the introduction of its latest series of metal-seated ball valves. The Krombach TUFSEAT Performance Series features a combination of critical safety and operational characteristics that provide consistent seat leak and torque performance capable of extending the life of the valve by up to 50% especially in high cycle and slurry applications. Labeled internally the «superior» metal-seated ball valve, the TUFSEAT outperforms bi-directional Class V and VI API-598/FCI 70.2 seat leakage standards at elevated pressures and temperatures.

The Krombach TUFSEAT offers a tighter inline seal made possible by its precision lapping of the metal ball and seat, and a secondary independent spring-energized seal. Patented pressure-assisted SX and S2 stem seals provide the highest protection against fugitive emissions while supplying side-load protection, further enhancing the life span of the packing. The high efficiency packing, along with live loaded seats result in lower torque operation, preserving sealing integrity and offering added protection from high cycles at higher temperatures.

To further protect the packing set, a high-density graphite ring supports the stem against misalignments and assists in eliminating fugitive emissions.

New RTD transmitter added to OleumTech H Series instrumentation portfolio

OleumTech®, a provider of industrial automation and IoT solutions, has announced the release of a new RTD Temperature Transmitter to its H Series line of hardwired instrumentation, available in 420- mA and RS485 Modbus.

The H Series RTD Transmitter is suited for mission-critical industrial applications where reliability and accuracy are of utmost importance. The newly added device is designed for use in Class I, Division 1 hazardous locations with an Explosion-proof, IP67-rated housing. Users can configure the device using the push-buttons on the backlit LCD interface while also gaining instant local access to temperature data.

“Our goal is to continue to develop feature-rich, highly reliable, and accurate process automation instrumentation while offering them at price points unrivalled by our competitors. With our new hardwired RTD Transmitter, we are doing exactly that. We will stay persistent in our efforts in providing new and better choices and enable OleumTech as a one-stop-shop for remote process automation needs,” said Vrej Isa, COO.

[Fig (2) OleumTech H-SeriesNew RTD transmitter]

Gardner Denver GD 2500Q HDF pump

[Fig (3) Gardner Denver GD 2500Q HDF pump]

Gardner Denver High Pressure Solutions (HPS) has announced the new GD 2500Q Heavy Duty Frame (HDF) quintuplex pump, designed to extend pump service life through an optimized power end frame design
The frame upgrade has been developed to increase component thickness and allow larger, stronger welds, to boost structural integrity.
Today's pumping conditions have pushed power end frames of all makes to their limits. The upgrade was designed with the aim of reducing stress in vulnerable areas in terms of:-
Top and bottom skin plates increased in thickness, offering more structural support for nose plate loads.
Main bearing plates have now increased in thickness and protrude between skin plates with larger, stronger welds, reducing overall frame and weld stress.
Stronger support structure for nose plate to reduce deflection around nose place welds.
Significant nose plate weld size increased, reducing stress in critical nose plate joint by more than 20%.
Deep beveling around outer main bearing plates, giving much deeper weld throat.
Eliminated snap ring bearing retainer and replaced with stronger, bolt-on outer main bearing retainer, giving improved axial tolerances for improved gear timing.
Challenge with the GD 2500Q HDF and added strength to our legacy design to increase fatigue life and improve manufacturability, both of which are critical in meeting the challenges of today's harsh frac environments."

Caterpillar Environmental friendly Engine

Well stimulation operations in the oilfield are complex and demanding. The 3512E Tier 4 Final engine for well service operations was specifically developed to meet Tier 4 Final emissions and to meet the highest standards in performance, durability, and reliability.
Cat engines are backed by the worldwide network of Cat dealers ready to support your operation with technical support, service, parts, and warranty. 3512E engines, with ratings: 1678 - 1864 bkW (2250 - 2500 bhp) @ 1900 rpm meet U.S. EPA Non-road Mobile Tier 4 final emission standards.

[Fig (4) Caterpillar Environmental friendly Engine]

GMI portable gas detector

[Fig (5) GMI portable gas detector]

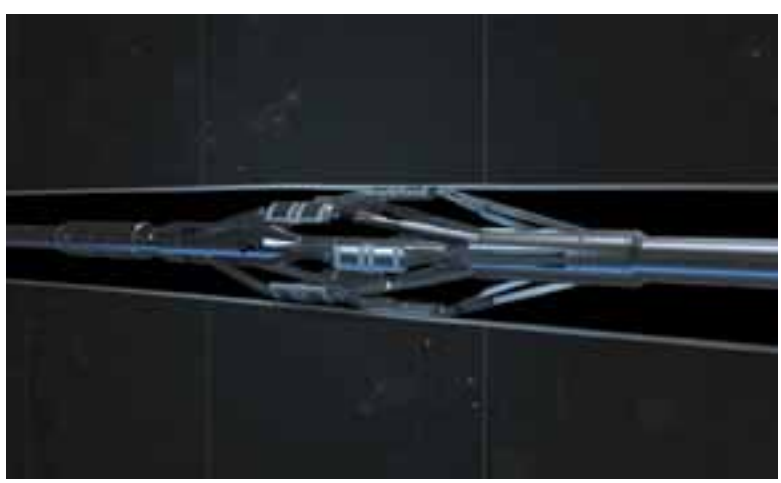
A robust and accurate portable gas detector, the Personal Surveyor (PS200 Series) provides unrivalled protection in confined space applications with audible and visual alarms in the event of exposure to flammable or toxic gases. Detecting and displaying up to 4 gases simultaneously, PS200 is suitable for a host of applications in a variety of industries. The PS200 can be configured to detect a combination of Methane, Oxygen, Carbon Monoxide, Hydrogen Sulphide, as well as other flammable gases. Pre-entry checking can be carried out with the optional internal sampling pump, and diffusion operation ensuring maximum battery life in confined spaces.

New advanced borehole imaging technology

The Halliburton StrataXaminer™ Imaging Service is a new wireline logging solution that helps operators acquire more accurate well data, better evaluate production potential, and increase return on investment.

StrataXaminer delivers high-resolution image of the reservoir structure to identify bedding, fracture patterns, fault zones, and potential flow barriers with greater accuracy.

StrataXaminer transmits high-resolution images of the reservoir structure to identify bed dips, open and closed fractures, fault zones, and potential flow barriers with increased accuracy. Eight imaging pads, with 24-buttons each, use high-frequency signals coupled to



HYPR HOLESAVER

The HyPR™ HoleSaver™ is the world's first hydraulic pipe recovery system. Using ordinary drilling mud, a highly powerful HyPR™ jetting dart cuts through full strength subs in just a couple of hours. The tool gives the user a truly low cost and rapid way to insure against extreme stuck pipe situations. Hydraulic darts are simple to use, completely safe and therefore provide for much faster program recovery.

[Fig (7) The HyPR™ HoleSaver™ is the world's first hydraulic pipe recovery system]

Intelligent asset management system from Rotork works in the cloud

Rotork has launched a program of advanced analytics for the management of intelligent flow control assets.

Intelligent Asset Management is a cloud-based asset management system for intelligent actuators and the flow control equipment they operate.

It is a system of advanced analytics to improve reliability and availability of key assets (such as valves) across all industries that use flow control processes

Failure of key equipment on any site or plant can result in unplanned downtime, poor performance, reduced output yields and reputational damage. By collecting data and monitoring asset status, Intelligent Asset Management can lead to long-term operational stability.

Intelligent Asset Management uses the information downloaded from the data logs recorded within intelligent actuators. Summary views and color-coded maps simplify complex analytics into easy to understand visuals. The key areas of information that are taken from data loggers and uploaded to Intelligent Asset Management are torque, temperature, vibration and event log information (such as open and close starts log, movement log and alarm log). Live diagnostic actuator data is available for sites that use a Rotork Master Station (via the Gateway computer), such as alerts and actuator status.

[Fig (8) ROTORK intelligent asset management system]

Watson 1100 Drill Rigs

The Model 1100 is a self-contained, hydraulic or mechanical drill unit specifically designed for mounting on a 6x4 truck or a crawler type undercarriage.
It is available in long or short mast versions with up to 4Kelly elements.

Key Specifications

LINEPULL	18,000 lb (79.2 kN)	DEPTH	96 ft (29.28 m)
WEIGHT	44,840 lb (20,357 kg)		

COUNTRY FOCUS:INTEREST REMAINS HIGH IN EGYPT'S GAS SECTOR

[LNG CONDENSED]

The Egyptian gas sector is not short of big players. The turnaround in its gas balance in recent years can largely be attributed to the exceptionally rapid development of the giant offshore Zohr field by Italy's Eni, and a swathe of major production projects engineered by UK major BP.

However, US major Chevron's arrival through the $5bn acquisition of Noble Energy, which was completed in October, brings another major on to the scene through the purchase of Israeli gas assets in the east Mediterranean with the intention of exporting production to Egypt.

Chevron now leads the group developing Israel's Leviathan and Tamar gas fields. Israeli project partner Delek Drilling announced January 19 that the group has agreed to invest in a shekels 738mn ($227mn) pipeline to bring their gas to Egypt. Israeli Natural Gas Lines (INGL) will build the pipeline between the Israeli cities of Ashdod and Ashkelon. The gas producers will cover 56% of the pipeline's cost, with INGL meeting the remainder.

Together with upgrades of the existing gas system that will cost a further shekels 27mn, the pipeline will enable Chevron and its partners to ship up to 7bn m^3/ year of gas to Egypt. This will add to Egypt's own domestic surplus, allowing it to ramp up pipeline exports to Jordan, if required, and LNG exports.

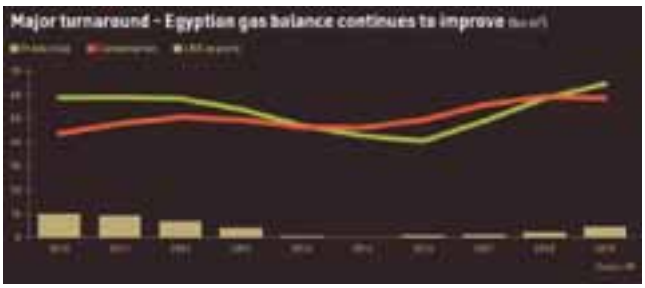
LNG plants

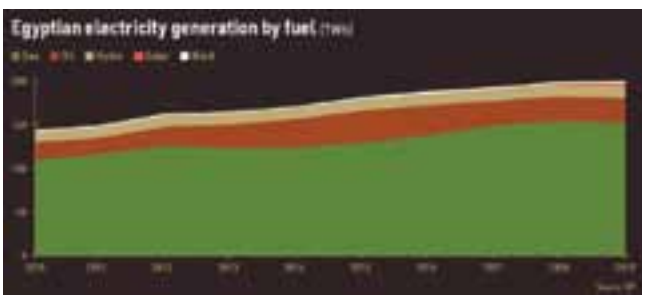
Egypt has two LNG plants, both of which started operation in 2005. Egyptian LNG (Idku), is located approximately 50km east of Alexandria,has two trains with total capacity of 7.2mn mt/yrand uses the ConocoPhillips' proprietary Optimized Cascade liquefaction technology as part of a license agreement signed in March 2003.The process utilises three multi-staged cascaded refrigerant circuits using pure refrigerants, brazed aluminium heat exchangers, and insulated cold box modules.The heat exchangers and cold box modules can be customised as per requirement. Depending upon the composition of the natural gas feed, additional units such as the heavies' removal unit (HRU) and nitrogen rejection unit (NRU) can be easily integrated with the existing setup.and is owned by a consortium comprising Anglo-Dutch major Shell, Malaysia's Petronas, the Egyptian General Petroleum Company (EGPC), the Egyptian Natural Gas Holding Co. (Egas) and France's Total.

The second plant, Damietta, with 5 million tons LNG output capacityper year. The initial capacity was designed to be 5.5 million tons of LNG per year. The complex includes the LNG liquefaction train, inlet gas reception area (metering and analysis), natural gas liquids removal and fractionation area, a docking jetty for tanker loading and transportation, LNG refrigerated storage and export facilities (tanks and booms), utilities and supporting infrastructure (power, water and roads), gas metering and treatment facilities (acid gas removal and dehydration), refrigerant condensate and LNG storage (two 150,000 m³ PC LNG storage tanks). The total investment costs of the LNG complex were around US$1.3 billion.

The Damietta LNG complex was designed by KBR and constructed by KBR, JGC Corporation, M. W. Kellogg Limited and Técnicas Reunidas. Saipem constructed storage tanks while Dodsal Pte Ltd was the subcontractor responsible for the construction of the mechanical works of LNG train.

Both plants have seen highs and lows since their completion.





From a peak of 14.7bn m3 in 2006, Egyptian LNG exports started to decline from 2009 as the government prioritised supply to the domestic but at prices too low to incentivise upstream investment, while demand, effectively subsidised by the state, raced ahead. By 2014, domestic gas consumption was beginning to outstrip production with LNG exports sinking to 0.4bn m3 and to zero the following year.

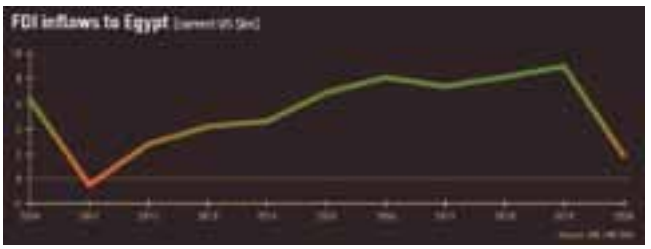
In a scramble to address its growing gas deficit, Egypt deployed floating storage and regasification units (FSRUs), turning it from an LNG exporter into an importer. By 2016, LNG imports reached 10.7bn m3.

However, a new government, higher gas purchase prices and the reduction in government debt for gas had started to pay dividends, resulting in major offshore developments, such as Zohr, coming onstream. By 2019, the FSRUs were gone and LNG exports have gradually re-emerged from the Idku LNG plant. They reached 4.5bn m3 that year.

2020 proved rocky for LNG plants producing spot cargoes and production from Idku declined sharply as spot LNG prices reached a nadir towards the end of April below $2/mn Btu. However, a sharp spike in winter spot prices saw a resumption of exports in the fourth quarter, averaging about 1.5 cargoes a week.

Damietta LNG

The winter price spike opportunity has been missed by the Damietta plant, which has been embroiled in complex ownership and contractual issues since 2012, delaying its return. However, these issues now appear to have been resolved, and the plant is slated to restart operations in the first quarter of this year.



Spain's Naturgy in early December 2020 announced that it had cancelled its 3.5bn m³/yr Egyptian gas purchase agreement. In return, it would receive up to $0.6bn and most of Union Fenosa Gas (UFG)'s assets outside Egypt and Spain.

UFG was a 50 - 50 LNG marketing joint venture Naturgy owned with Italy's Eni, which has now been dissolved. Eni said after the restructuring it would own half of Segas, the company that owns Damietta. State entities Egas and EGPC would hold 40% and 10% respectively.

Eni will also take over the contract for the purchase of natural gas for the plant and will receive corresponding liquefaction rights, thus increasing the volumes of LNG in its portfolio by 3.78bn m³/yr, which will be available free on board, the company said.

The completion of the transaction, planned during the first months of 2021, once customary conditions are met, including the restart of operations in Damietta, will result in Naturgy's departure from the Egyptian gas scene.

Investment crowding in

With legal and feedstock issues relating to LNG put to bed, the wind is set fair for the Egyptian gas sector, owing to increasing domestic demand – the government plans to increase gas use in the power sector, heating and transport -- broadening export options and attractive upstream prospects, which continue to draw in investment dollars.

On January 21, the UAE's Mubadala Petroleum announced that it has bought a 27% stake in the Shell-operated Red Sea Block 4 off Egypt. Mubadala has signed a concession agreement for the share with Egypt's petroleum ministry.

The 3,084 - km² Block 4 lies in the Northern Red Sea, adjacent to the prolific Gulf of Suez basin, Mubadala said, adding that the concession had «the potential to unlock substantial new prospects.» Shell has 63% and Egypt's Tharwa has 10%.

Also in January, Total won an operating stake in the North Ras Kanayis block in the Egyptian Mediterranean. Its partners are Shell (30%), Kuwait's Kufpec (25%) and Tharwa (5%). The exploration extends from 5 to 150 km from the shore and water depths range from 50 m to 3,200 m. The Herodotus Basin is an under-explored area and the partners› commitment includes a 3D seismic campaign during the first three years.

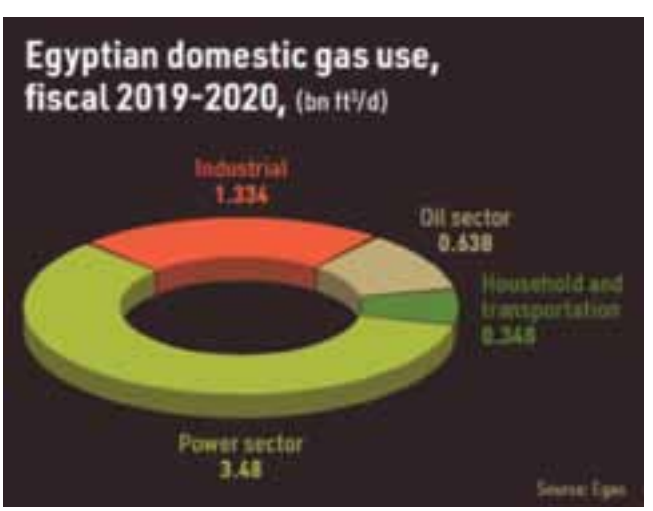
Meanwhile, Mediterranean-focused exploration and production company Energean has also expanded its presence in both the Egyptian and Israeli gas sectors through its acquisition of Italy's Edison, a deal some time in the making, but which finally closed in December.

The company has lost little time in getting started. On January 21, Energean took a final investment decision on a subsea tieback project at the North El Amriya(NEA) and North Idkunea (NI) concessions offshore Egypt. The NEA area contains the appraised Yazzi and Python gas discoveries, while the NI acreage holds four more gas finds, one of which is ready for development, Energean said. First gas from NEA/NI is on track for the second half of 2022, with the project targeting 49mn barrels of oil equivalent in proven and probable reserves. Some 87% of this resource base is gas.

Foreign direct investment

Oil and gas investment in Egypt accounted for about two-thirds of foreign direct investment (FDI) in 2019, which totalled $9bn, a rise of 11%, according to the UN Conference on Trade and Development, making Egypt the largest recipient of FDI in Africa.

2020 was a torrid year for FDI globally, owing to the coronavirus pandemic, with natural resource-based economies in Africa being hard hit. Inflows to Egypt dropped 57% to an estimated $1.9bn in the first half of the year, but the renewed interest being shown in the gas sector at the beginning of 2021 suggests FDI flows into Egypt could recover well this year.



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THE GROWING IMPORTANCE OF THE EGYPTIAN DOWNSTREAM SECTOR

Egypt's oil and gas downstream market is expected to grow at a CAGR (Compound Annual Growth Rate) of more than 5% during the forecast period. Factors such as supportive government policies, efforts to grow the downstream sector coupled with upcoming projects, are expected to drive the market studied. However, the high capital investment required coupled with a lack of financing due to a global economic slowdown in the event of the COVID-19 outbreak is expected to hinder the growth of the market in the coming years.

The Refineries segment held the major market share in 2019, and it is likely to dominate the market during the forecast period.

Favorable policies for investment by private players in the sector is expected to provide a significant opportunity for the market players.

Growing oil and gas consumption in the country is expected to be the major driver for Egypt Oil and Gas Downstream Market.

Downstream industry is for the majority state-owned – this puts a strong emphasis on government support measures

and policies. Unfortunately, as in most countries with a similar setup, refining has seen less investment compared to upstream E&P.

A sector which has secured the country with a stable supply of oil and gas and opportunities to export in the region, but at the same time – lost opportunities in producing higher-margin products.

The Downstream industry mostly relies on partner(s) investments – like neighboring countries in ME (and Asia) in their period of rapid growth, Egypt clearly made it a key strategy to attract investors from all parts of the world - through JV schemes. Both 2019 and 2020 have seen an unprecedented number of MOUs signed:

1. BP signed an agreement with the Ministry of Petroleum and Mineral Resources to convey petroleum middle management training, developing offshore fields, and discussing with the country's President and Bechtel a petrochemical complex planned for the Suez Canal Economic Zone;
2. Shell also signed an agreement with the Ministry for developing their personnel;
3. Egyptian Petrochemicals Holding Company (EChem) and Bechtel signed the MOU for the refinery complex project;
4. Egypt Petroleum Company (EGPC) and Schlumberger will jointly build, operate and transfer Egypt's Upstream Gateway (EUG);
5. EBRD will invest US$ 60 mln. to become a shareholder in Infinity Energy S.A.E., one of Egypt's leading private energy companies, along with JV agreement between Infinity Energy and Abu Dhabi Future Energy Company PJSC "Masdar" to develop renewable projects.

In addition, Egypt is also very present and active in other countries - developing cooperation with Somalia, Equatorial Guinea, and Chile.

Without doubt, the petrochemical sector is booming in Egypt and is leading the region's development: according to ICIS, the announced capacity additions are over 10 mtpa by 2030, with CAPEX of close to $12 billion in the period.

Potential remains high – Egypt is in top-8 of major PET importers from Europe, increasing its volume 50 times – from 1 to 57 thousand tpa in a two-year period (2017 - 2019). It is predicted that pressure on prices will come from PET capacity increases coming on stream in Asia.

At the same time, Europe is second largest exporter of PTA to Egypt – while there was no trade in 2017, last year saw a large amount of PTA imported – over 67 thousand tonnes – again, a significant change that means an opportunity for future import substitution.

ExxonMobil stated, that in 2019, Egypt, along with Nigeria, South Africa, and Morocco, bought large volumes of base oils, notably Group I.

The Petrochemical Industry is looking to expand significantly – with 11 new projects with total investments estimated at $19 billion. The new strategy adopted by Egypt will be developed and implemented through to the year 2035. The final version of the plan is currently being reviewed in preparation for its approval.

Key Projects

COMPANY NAME	PARTNERS	INVESTMENT	PROJECT GOALS	CAPACITY
ASSUIT NATIONAL OIL PROCESSING COMPANY (ANOPC)	PETROLEUM AND MINERAL RESOURCES MINISTRY, ENGINEERING FOR THE PETROLEUM & PROCESS INDUSTRIES (ENPPI) and TECHINT ENGINEERING	US$ 2.5 bn	Refining Residue Upgrade: maximise the utilisation of resources using latest hydrocracking technology to refine heavy vacuum oil residue, into petroleum products of a higher value, mainly diesel with European specifications, produce Butane and naphtha for high-octane gasoline production.	2,8 mtpa
EGYPTIAN PETROCHEMICALS HOLDING COMPANY (ECHEM)	BECHTEL, MINISTRY OF PETROLEUM & MINERAL RESOURCES (MOPMR), CENTRAL BANK OF EGYP, AMERICAN EMBASSY	EPC US$ 6.7 billion	Grassroots integrated refining and petrochemicals complex: to meet increased demand for transportation fuels and petrochemical products on Egypt's domestic market and exports	2,7 - 3,2 mtpy: 0,9 mtpy - Petroleum Products 1,2-1,9 mtpa - Petrochemical Products

COMPANY NAME	PARTNERS	INVESTMENT	PROJECT GOALS	CAPACITY
EGYPTIAN REFINING COMPANY (ERC)	QATAR PETROLEUM	US$ 4,4 bn grassroots	Refining residue upgrade project: to process about 4.7 million tonnes/year of mainly atmospheric residue feed from the adjacent 145,000-b/d Cairo Oil Refinery Co. to produce Euro 5-quality refined products, such as diesel and jet fuel, intended for consumption primarily in Cairo and surrounding areas.	4,7 mpta
ETHYLENE AND DERIVATIVES COMPANY (ETHYDCO)	PETROJET, SAIPEM	$ 180 million	Production of Polybutadiene: to produce 36,000 tons per year of Elastic Poly Butadiene at Ethydco company based on 20 thousand tons per year of Butadiene produced from Ethydco and SIDPEC companies to maximise the added value, cover part of domestic demand and export the surplus	0,020 mtpa Butadiene
METHANEX	EGYPTIAN MAINTENANCE COMPANY (EMC) SUN MISR, WADI El-NILE, ZAVKOM, ENPPI;	$117 million	Methanol and Derivative Project	0,110 mtpa urea-formaldehyde products, naphthalene and sulfonal-formaldehyde.
METHANEX		$400 million	Polyacetal Project	50,000 tons annually of polyacetal products
MIDDLE EAST OIL REFINERY (MIDOR) / ALEXANDRIA	UOP, Woodmac, TechnipFMC;	$2.3bn	Middle East Refinery Expansion: increase the total production from the current 100,000 barrels per day (bpd) to 160,000bpd of refined product, to increase the middle distillate yield as well as meet the domestic requirement for Euro V grade fuel	~ 6,9 mpta
MINISTRY OF PETROLEUM AND MINERAL RESOURCES		$8.5 billion	Refining and Petrochemicals Complex: studying the construction of a new refinery and petrochemicals complex in the Al-Alamein region	2,5 mtpa

COMPANY NAME	PARTNERS	INVESTMENT	PROJECT GOALS	CAPACITY
MISR FERTILIZERS PRODUCTION COMPANY (MOPCO)		$260 million	Melamine Project	60,000 tons annually of urea.
SIDI KERIR PETROCHEMICALS COMPAY (SIDPEC)	W.R. GRACE	$ 1.6 billion (phase 1)	Production of Propylene and Derivatives: to cover local demand and export the surplus, the project depends on the utilisation of the available propane quantities with the facilities of GASCO in Alexandria instead of exporting them	0,45 mtpa
SUEZ OIL PROCESSING COMPANY (SOPC) EL-NASR PETROLEUM REFINERY	PETROJET	$445 mln	Developing three salt separators for the first time with an integrated work system aiming at refining 816 tons of the crude oil per day with an integrated plan to develop the petroleum sector's refinery.	816 tpd
SUEZ OIL PROCESSING COMPANY (SOPC) EL-NASR PETROLEUM REFINERY		$ 50 million	Formaldehyde and its Derivatives Production project (SMD): to maximise the added value of methanol produced by Emethanex, the urea produced by MOPCO and the caustic soda produced by the Egyptian petrochemical company	0,052 mtpa Formaldehyde 0,026 mtpa Naphtalene

Challenges & Development Areas

With most world regions facing similar problems and challenges it is interesting to look at the MENA region and analyse the different strategies that have been applied in the oil, gas and petrochemicals sectors.

When faced with a downturn and/or increased competition companies look to review capital-intensive sectors and give priority to rational operational cost reduction and risk optimisation. This is to sustain margins and save market position.

In addition, investment strategies are reviewed and, in some cases, revised – having said that some majors prefer not to scale back, because this could lead to unfavorable loss of future profits.

Asset management is brought to the forefront of priorities, grounded by the structure and degree of depreciation of production facilities in the region. It addresses many issues, including supply chain and maintenance efficiency and, partly, performance management.

Human resources have long been a key area for industry development in the region: there is an available pool of potential human resource and investments have been made in education and training. There also has been a conscious effort made by companies to find the right balance number between local and foreign specialists.

The next step will likely be focused on diversification – both geographic and in terms of products – and expanding to new emerging markets, preferably outside the region.

Other areas for industry efficiency increase that haven't been mentioned but of importance relate to infrastructure development: pipeline and port construction, more gas-fired electricity generation units, unconventional gas projects, local supplier development and independent power producers, methanol, urea and fertilisers production for local use.

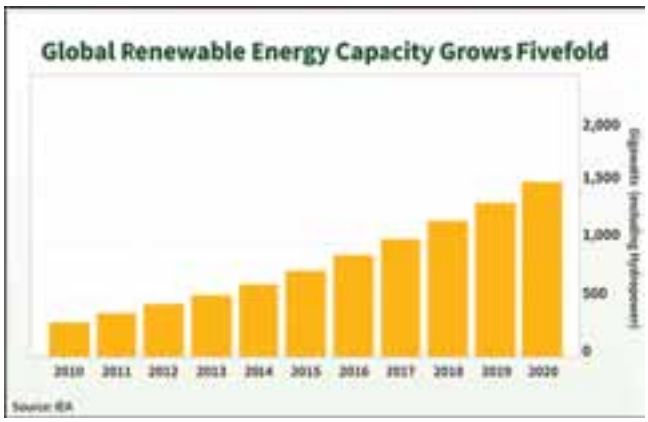
All of this clearly illustrates the willingness and drive to grow and further develop the Egyptian Downstream industry. In 2021, the oil processing industry will decrease the overall budgets but is expected to still invest in major projects that are critical for future performance, Middle East focusing on boosting higher-value products portfolio low-sulfur and transportation fuels and petrochemicals, also increasing gas processing capacity and logistics infrastructure.

THE DARK SIDE OF GREENENERGY AND ITS THREAT TO ENVIRONMENT

The future looks bright for renewables,two-thirds of the new power generation added in the world last year was solar and wind — a total of 119 gigawatts (GW). That's according to a report from BloombergNEF.

The report adds that renewables, including hydro, accounted for 27% of total power produced last year, up from 20% in 2010.

And the International Energy Agency (IEA) says global renewable power generation, excluding hydro, has increased five-fold since 2010.

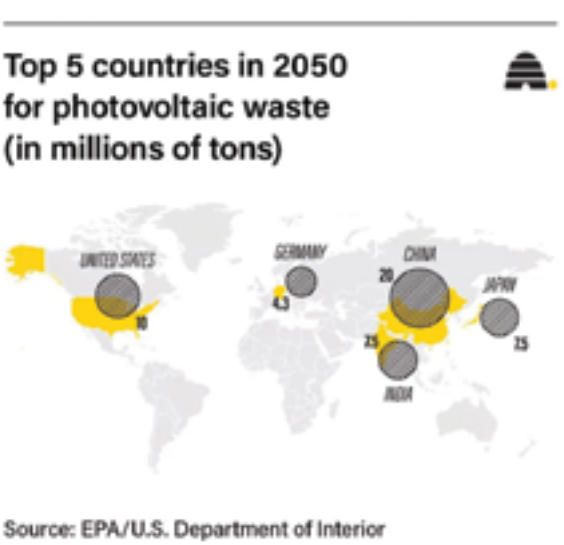


Countries are feverishly looking to install wind and solar farms to wean themselves off carbon-based, or so-called "dirty" energy, few countries, operators and the industry itself have yet to fully tackle the long-term consequences of how to dispose of these systems, which have their own environmental hazards like toxic metals, oil, fiberglass and other material.

A briefing paper released by the U.S. Environmental Protection Agency predicts these startling global numbers for countries by 2050 just for solar waste:

- United States, 10 million tons.
- Germany, 3 million tons.
- China, 20 million tons.
- Japan, 7.5 million tons.
- India, 7.5 million tons.

Solar arrays have a life cycle of about 30 years, but the rapid adoption of solar in the United States and elsewhere has the problem of disposal creeping up in the rearview mirror — faster rather than later.



Green waste growth

In 2019, according to the Solar Energy Industries Association, the United States surpassed 2 million solar installations, just three years after it hit the milestone of 1 million installations.

The paper points out that the growth of solar waste is already straining recycling and disposal capabilities, with some panels improperly ending up in municipal landfills or stacking up in warehouses while the wait continues for more inexpensive routes to recycling.

Research underscores there are few incentives to recycle solar panels, as the cost of recovering the materials outweighs the costs of extracting what can be recycled — even without adding in transportation expenses.

The issue foreshadows the potential for the creation of a new class of hazardous waste sites under EPA Superfund designations as clean energy operators walk away from a large volume of materials that contaminate the soil and groundwater.

"It is foreseeable that the same kind of practices could occur with respect to (solar) panels in the absence of very effective programs for the collecting and recycling of PV panels available where PV panels are used," the paper said.

The problem is not limited to large-scale solar utility farms but also to individual households and businesses that over the years have opted to install rooftop solar panels.

"More homeowners are installing solar panels as they have become cheaper, but those modules have less potential for recycling and recovery of materials due to their smaller size and lower number of panels versus commercial installation," the paper noted.

The disposal of hazardous waste is regulated and monitored under Utah law, and landfill operators are trained on what material to look for that poses potential threats to the environment, said Brian Speer, solid waste manager for the Utah Department of Environmental Quality.

"Certainly these wastes are on our radar, but we are currently not seeing a demand to dispose of these wastes in any significant quantity," he said.

That specter of demand is just a couple decades away as some of the early photovoltaic modules reach their end of life and homeowners, businesses and utility-scale operators face the prospect of safe disposal.

Speer said he is hopeful that the research being done by the U.S. Department of Energy and the EPA will provide an environmentally safe pathway for proper disposal.

"The capacity issue is one we hope is answered before the need arrives," he said.

Kate Bowman, Utah Clean Energy's renewable energy program manager, said there needs to be more research on

how to safely recycle high-value materials such as cobalt and lithium.

The research, she added, will help address the waste problem.

Cost hiccups

The solar industry is looking to use fewer precious metals and other elements in the manufacturing process, decreasing the amount of silver in panels by 70% since 2010.

While using less silver is economically attractive up front and less labor intensive, it makes recycling the solar panels less attractive. The cost decrease in the panels themselves has the potential to backfire, the paper warns, and some of these newer panels are more fragile and likely to break, hastening the need for their disposal.

The report notes that "not much has been done in the United States to address the PV waste issue," and most novel policies in this arena are emerging from Europe.

In 2017, the state of Washington became the first in the nation to require recycling for these systems and to mandate a "take back" program for manufacturers at no cost to the homeowner. Utah, at this point, does not have such a mandate and it remains to be seen how effective the law will be. The EPA notes that such a law still does not address issue of where the waste winds up.

Tilting at windmills

Wind power also is taking off as a clean energy resource, but the EPA notes that windmills are the least energy producing and most physically difficult renewable energy waste stream to address.

The sheer size of the windmills and the difficulty of disposing of them at recycling stations led the agency to conclude that each new wind farm is a "towering promise of future wreckage."

Wind turbines that are part of the Milford Wind Corridor Project north of Milford, Beaver County, are pictured on Friday, Jan. 15, 2021. As turbines or other "green energy" products such as solar panels wear out, they are creating a new class of hazardous waste that must be dealt with. Spenser Heaps, Deseret News

While there is a market for second-hand windmills in Eastern Europe, Asia and Latin America, the tactic of shifting used windmill components to other countries simply delays the waste disposal problem and puts it on the shoulders of countries less equipped to deal with the challenge, it noted.

Like coal mining or other natural resource extraction, certain entities in Utah and elsewhere have addressed the afterlife issues of wind and solar farms by requiring environmental remediation or the posting of a reclamation bond to ensure proper cleanup and disposal.

"This is something we have thought a lot about," said Keli Beard, general counsel with the Utah School and Institutional Trust Land Administration.

The first wind project in Utah came online in Milford in 2009 and eventually expanded to a 306-megawatt facility in Beaver County.

Nine of the windmills are on school trust lands, with each of them accompanied by a reclamation bond required by the agency, Beard said.

For any of the renewable energy projects located on school trust lands, Beard said there is a requirement that the reclamation plan be conducted by an independent engineer to assure it appropriately repairs the landscape.

The contractural arrangement provides for operating agreements that can be extended over the life of the project, which Beard says gives them as the landowner a way to invoke new requirements as disposal technology advances.

"Often in that operations period there is an option to renew or extend the agreement," she said. "We are concerned that at the end of life of these projects, the cost of recycling and removing them will be far more than the value of what is left on the land."

Beaver County enacted environmental assessment and disposal requirements for solar farms within its boundaries.

Kyle Blackner, zoning administrator, said when a project is decommissioned the plant's components and associated infrastructure would have to be removed to a depth of 36 inches from the site.

"Milford Solar (or the current owner) would salvage economically recoverable materials, and unsalvageable materials would be recycled/disposed of at a location authorized by Beaver County."

The Bureau of Land Management, too, requires bonds sufficient to reclaim the land to its original state. But these reclamation requirements still don't address the looming problem of what happens to these materials at disposal, and they don't guarantee the operator won't simply forfeit the bond and walk away regardless.

Electric vehicles bring own challenges

As state fleets and the general public increasingly embrace electric vehicles, that "clean" move comes with its own environmental challenges.

The value of the materials recycled from lithium ion batteries is only about a third of the cost of the recycling operation — and the expense of extracting old lithium is about five times the cost of mining for lithium, according to the Institute for Energy Research.

There is some innovation playing out, however, with Japan's Nissan repurposing batteries to power streetlights. In the United States, General Motors is backing up its data center in Michigan with used Chevy Volt batteries.

The EPA notes, however, that these sort of "adaptive reuses" still only delay the time for final disposal of the batteries and the need to deal with materials in the batteries that can cause fires or leach hazardous chemicals.

On the wind power front, GE announced last year it had reached a multiyear agreement with Veolia North America to launch the United States' first wind blade recycling program, according to an article in Utility Dive.

Nearly 90 % of the blade material, consisting of fiberglass, would be repurposed for cement production, cutting carbon dioxide emissions from that source by 27%.

With the release of its paper, the EPA is calling on researchers, states, industry and other federal agencies to ensure green waste is sustainable from end to end and that gaps in renewable energy waste management are addressed.

"While consumers may purchase renewable energy or renewable energy-based products with good intentions, that does not prevent the unintended adverse environmental consequences of these products," it said.

Development of an LNG Tandem Offloading System Using Floating Cryogenic Hoses - Breaking the Boundaries of LNG Transfer in Open Seas

By: Benjamin Mauriès, Saipem; Frédéric Benoit, Saipem; and François Lirola, Saipem, Vincent Lagarrigue, Trelleborg

Abstract

This paper presents the extensive work performed to propose to the LNG industry an offloading solution fully compliant with EN1474 standard requirements using floating hoses. Between 2009 and 2013, a tandem offloading system using floating cryogenic flexible hoses developed and qualified to be able to transfer LNG in open seas. This arrangement was selected in order to combine the safety and the availability brought by the tandem configuration with the wide operational envelope provided by the use of floating hoses.

This system is composed of an innovative and compact hose storage system on the LNG Terminal allowing to store the hoses between two offloading operations, of a connection head (hose end termination piece) to ease the deployment/retrieval of the hoses and of a storage and maintenance platform for the connection head at the aft of the LNG Terminal, also allowing to replace a hose section in offshore conditions. On the LNG Carrier side, a bow loading platform is installed to ensure hoses connection even in exposed environmental conditions. The 20" ID cryogenic floating hoses to be used with this system has been developed and qualified in parallel with the development of the tandem system.

A red line for this development was to keep a similar level of safety, integrity and performance to onshore offloading operations. To fulfill this requirement, simple, robust and proven technologies have been considered for the main items of the system. The system incorporates a comprehensive panel of safety layers through monitoring, hardware, procedures and control philosophy providing protection for people and material during all steps of the offloading sequence. Regarding the performance, the system can transfer LNG at a flowrate of 10, 000 to 12, 000 m^3/h using three hoses, which gives redundancy to transfer LNG even with one hose unavailable. To offer a high availability, dedicated solutions have been implemented in the system to withstand sea states with Hs up to 3.5 m for hoses connection and 4 m for cargo transfer and hoses disconnection.

This solution will help unlocking offshore stranded gas resources in many areas around the world through FLNG development.

Evolution of the LNG offshore transfer design approach over the years

The idea of moving an LNG terminal offshore dates back to the 70's at least. During many years the concepts have firmed up and the technical barriers and challenges have been addressed progressively to make offshore LNG terminal a reality. Among those technical challenges, the transfer of LNG between the offshore terminal and the LNG carriers has followed this step-by-step progress. The starting point for this technology evolution was the traditional ship-to-shore offloading operations as performed in onshore LNG terminal. The common way of loading or unloading LNG between an LNG carrier and an onshore terminal consists in berthing the carrier alongside a jetty usually protected by a breakwater to limit waves as much as practically possible. The LNG is transferred by means of articulated loading arms with flexibility to connect to different types of LNG carriers with small relative motions.

Most of the first offshore LNG terminal projects were actually near shore Gravity-Based Structures (GBS) used as regasification terminals, like Adriatic LNG terminal in Italy. Such projects were considering the berthing of the LNG carrier alongside the GBS, where the terminal structure was still acting as a partial shelter against waves. Similarly, the first Floating Storage and Regasification Units (FSRU) in Brazil were installed berthed alongside jetties in sheltered portal areas. For both types of projects, the relative motions between the carrier and the terminal increased, but in a limited way. The technical solution to transfer LNG was managed by improving the design of the LNG loading arms used onshore through an increase of arms size and of swivels capabilities to cope with larger motions and accelerations.

A new step was reached in 2013 with the start of operations on the FSRUTOSCANA located offshore Italy near Livorno (Figure 1), which is the first permanent FSRU to be installed in open seas. For this project, no breakwater is protecting the terminal, which is turret-moored and, thus, is usually facing wind and waves. LNG carriers berth again alongside the FSRU, which is also a converted carrier. Therefore, there is hardly any protection for the carrier against the environmental conditions. Marinized loading arms were again selected for this project, enabling to match project availability requirements.

However, such side-by-side offloading operations in open seas are only feasible for relatively mild environmental conditions. This is mostly due to limitations in tugs capabilities to operate efficiently in harsher sea states and due to challenges to design the mooring lines and loading arms for too large relative motions while preventing any risk of collision between the floating terminal and the LNG carrier.

Side-by-side offloading configuration with loading arms has supported the development of offshore LNG terminals up to now, and remains today the only offshore LNG transfer configuration which is under operation in the world. But it will not enable to transfer LNG in some areas with harsher sea conditions than the ones considered above, meaning that alternative solutions need to be developed for these locations.

Moving LNG carriers away from floating LNG terminal with tandem configuration

The "breakthrough" solution the most widely considered by the industry to go beyond the limitations of side-by-side offloading for LNG has been the tandem offloading configuration for nearly 15 years. This can be explained by the fact that tandem offloading is by far the most common solution to unload oil from FPSO's all over the world (approximately 85%). Indeed, beyond the theoretical possibility to perform the offloading operation in more severe environmental condition, this configuration is well perceived on the safety perspective. Moving the tanker away from the side of the floating terminal decreases significantly the risk of collision between the two vessels and the risk of escalation in case one of them is facing an accident, fire or blast. This configuration also reduces or eliminates the need for tugs during cargo transfer, for example through the use of LNG carrier fitted with a Dynamic Positioning system (DP).

LNG tandem offloading systems have not yet been implemented on an actual project, so the discussion below is based on concepts and systems developed and qualified. Several technologies have been considered and developed over the past few years to transfer the LNG from one vessel to the other with either rigid articulated systems or flexible pipes and hoses. The first solutions had the in common to be aerial systems, i.e. systems where the pipes/hoses remain out of the water in all conditions and are connected to dedicated bow manifolds on the LNG carrier. This was avoiding the technological challenge of having key components (swivels, flexible hoses, connectors) submitted to seawater. However, to keep these components out of the water, while maintaining a sufficient distance between the two vessels, these systems usually require quite large and/or sophisticated dedicated supporting structures on the terminal and at the bow of the carrier for their connection. Besides, to prevent any risk of damaging the system or its components, the LNGC carrier bow position often needs to be more tightly controlled than it is usually the case for oil tandem offloading operations. This can mean additional power requirements for DP systems on the LNG carrier, if DP is considered, and heading control on the floating terminal to limit fish-tailing motions.

An alternate solution for tandem offloading is to consider cryogenic floating hoses (Figure 3). Again, the idea is not new but the technical challenges to design a hose able to withstand the loads induced by the transfer of LNG and the motions on the sea surface (including the fatigue aspect) and that is resistant to the seawater have limited the number of initiatives. However, using floating hoses significantly relaxes the positioning constraint of the LNG carrier relative to the LNG terminal: the LNG carrier can stand farther from the terminal and can be allowed larger sway excursions (or tolerate higher fish tailing motions from the LNG terminal), similar to the oil tandem offloading practices that the oil&gas operators are familiar with.

Another benefit usually expected from a floating hose tandem configuration is to be able to connect hoses at the mid-ship manifolds of the LNG carriers. This would allow in principle to have standard LNG carriers able to load or unload LNG from the LNG terminal. However, the lifting capabilities of standard LNG carriers are generally not compatible with the lifting of such hoses in open seas. Therefore, dedicated equipment would generally need to be installed at mid-ship manifolds platform to do this connection. The standard vessel becomes a dedicated one. Therefore, the most mature designs of tandem offloading systems using floating hoses generally propose a hose connection at the bow of the LNG carrier, like aerial tandem systems. This reduces the length of hoses required and limits occurrence of friction between the hoses and the carrier hull.

The authors of this article and their respective teams started the development of such a tandem offloading system back in 2009, at a time where no mature concept with floating hoses was available, whereas marine loading arms were being

proven as explained above and aerial tandem systems were already being developed and qualified by several technology providers. But as explained earlier, several design challenges had to be tackled to provide a concept that met the target of offloading LNG in more severe environmental conditions than with side-by-side configuration, while adressing the safety and operations concern of potential users of the system.

System presentation

The tandem offloading system detailed in Figure 4 is designed around the floating hoses with the functions of storing them, deploying them, connecting/disconnecting them, while guaranteeing an optimal level of control, safety and maintainability. The three floating hoses have an internal diameter of 20" and a length of approximately 200m for a nominal distance between the LNG terminal and the LNG carriers of 100m (typical value that may be adjusted to the need and philosophy of each operator). Two hoses are dedicated to LNG transfer targeting total offloading flowrates of 10, 000 to 12, 000m^3/h. The third hose is dedicated to vapor return.

The three hoses end terminations are bolted through a spool piece to a common connection head. A short section of rigid piping connects them to the termination valves. A by-pass line with a valve connects the two liquid lines together. Stainless steel tubular structure protects the piping components and houses floatability modules that make the connection head float when transferred from one vessel to the other.

A hoses storage system is located onboard the LNG terminal. The three hoses are stored independently from one another on horizontal stages rotating around the same shaft structure. Coming out of the rotating stages, the hoses are guided down along the aft transom of the LNG terminal.

A storage and maintenance platform for the connection head is installed on the aft transom of the LNG terminal. The connection head and its components can be checked and inspected on this platform before and after each offloading operation. The platform also provides equipment to inert the hoses and to facilitate the connection of the handling wires, which are the lines used by the LNG carrier to drag the connection head and hoses to the bow loading platform on the carrier.

On the LNG carrier side, a bow loading platform is used to lift and connect the connection head and hoses to dedicated manifolds in sea states with significant wave height (Hs) up to 3.5m. The connection head can stay connect and be disconnected in Hs up to 4m. The weight of the connection head is supported by the structure of the platform, so that the couplers connected to the connection head en termination valves see very limited loads. Therefore, standard QC/DC couplers and valves can be used for the purpose.

The platform also houses mooring equipment if the operators intends to moor the LNG carrier to the LNG terminal by means of a hawser.

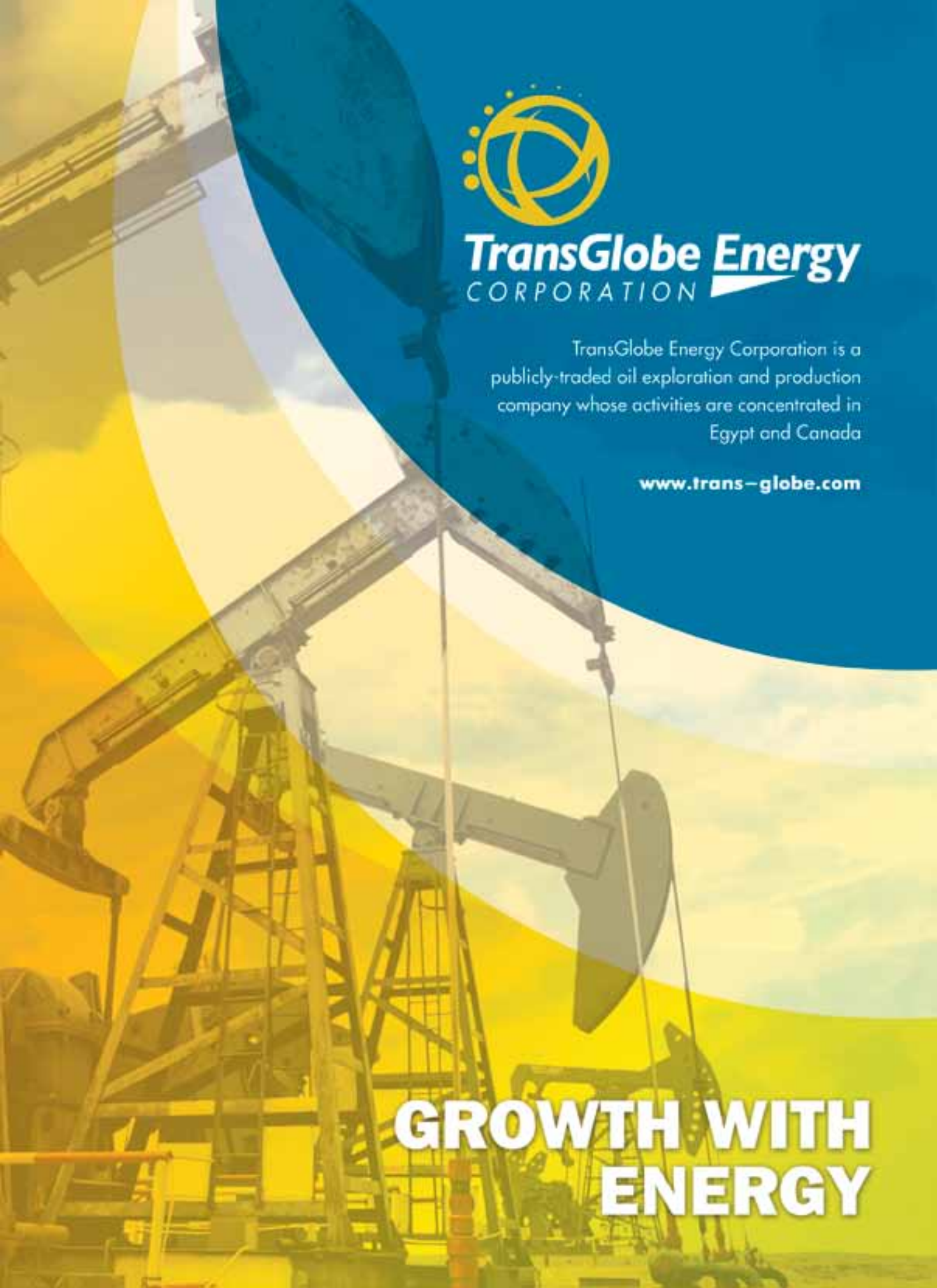
Design and qualification of an LNG floating hose

The main technical challenge was obviously the development and qualification of the floating hose for LNG. Our partner developed a hose-in-hose concept (Figure 5) combining for the purpose two proven technologies: the composite hose technology used to make ship-to-ship transfer of LNG and the rubber bonded hose technology used to load or unload oil in tandem configuration or through marine buoys. The LNG is conveyed in the inner 20" internal-diameter composite hose, at a flowrate up to 6, 000m^3/h, which limits pressure drops through the hoses and, consequently, the boil-off gas production to a comparable level with onshore jetties loading configurations. The hose is designed to be operated at a pressure up to 15 barg and has a design life of five years considering two offloading operation per week. Each hose string is made of 12m-long hose sections.

The inner hose is made of several layers of polymeric fabrics and films sandwiched between two stainless steel helices (Figure 6). This construction provides flexibility that is maintained even in cryogenic conditions. The annular space between the two hoses is filled by an insulating material which prevents the outer rubber hose from reaching too low temperatures. The insulation layers allow inerting the annular space with nitrogen if need be. An optical fiber that can detect and locate any leak from the inner hose or the outer hose is also inserted in this annular space. Should a leak be detected, it is possible to identify which section is concerned, while the tandem system make it possible to replace this one section without external assistance to the LNG terminal.

The outer hose is designed similarly to standard oil loading line to be able to withstand external loads. It is a reinforced bonded flexible hose made of rubber, steel rings and reinforcement layers, end-fitted with an integrated gasket flange system. Such design is well-known for its fatigue resistance and high strength capacity. The end fittings pieces ensure tightness of both internal and external hoses, while minimizing heat losses: no ice is expected to appear on the outer hose surface during operations at positive temperature conditions.

The qualification of this floating hose is a significant challenge in itself that is detailed in OTC paper 25413-MS called "Qualification Of A Cryogenic Floating Flexible Hose Enabling Safe And Reliable Offshore LNG Transfer



TransGlobe Energy CORPORATION

TransGlobe Energy Corporation is a publicly-traded oil exploration and production company whose activities are concentrated in Egypt and Canada

www.trans-globe.com

GROWTH WITH ENERGY

An Interview With

MR. RANDALL C. NEELY, C.A., CFA

President and CEO, Director
TransGlobe Energy Corporation

TransGlobe Energy CORPORATION

Can we update our readers insight on the TransGlobe strategy in light of the current oil market?

Given the ongoing oil price volatility, TransGlobe is continually focused on strict capital discipline through operational cost controls and minimizing our exposure to financial leverage by remaining debt-averse. Despite market volatility, we have positioned ourselves as a nimble company with the ability to create value through a balanced portfolio of exploitation, development and exploration opportunities across our diversified onshore assets in Egypt and Canada. This approach has enabled us to build our production base, generate strong cash flows and provide a return to shareholders through a semi-annual dividend.

Where are the most promising areas / concessions the company is working in?

We are most excited about our low-risk development operations in Egypt and our newly discovered resource potential in the Cardium play in Alberta. In Egypt we are particularly focused on the continued expansion of our Eastern Desert Concessions. For the past year plus we have been working alongside the Egyptian General Petroleum Company ("EGPC") to develop a framework to extend the concessions and amend our licenses which will provide for the increased development and recovery of the oil in place in those legacy concessions through increased secondary as well as tertiary recovery approaches. We believe that some of the techniques utilized in our Canadian operations, namely horizontal drilling and multi-stage completions will be directly applicable to certain areas within our concessions in the Eastern Desert.

TransGlobe has been working in Egypt for more than a decade, what are some attractions in the Egyptian petroleum sector?

The production and distribution of oil is an integral part of Egypt's economy and the country has developed a well-established service industry to support exploration and development operations, exemplified by an increasingly large and talented workforce. This presents an exciting opportunity for TransGlobe to operate within. Addition-

ally, we are very encouraged by the leadership within the Ministry and EGPC who continue to work towards a modernization of the industry which we believe will lead to a stronger and more investible operating environment once completed.

What is the amount of TransGlobe`s 2019 allocated budget here in Egypt with reference to other countries? And how many wells do you plan to drill during the current calendar year?

Our 2020 capital program equates to $37.1 million (before capitalized G&A), which includes $23.7 million for Egypt and $13.4 million (C$17.4 million) for Canada. This plan is strategically aimed at maximizing free cash flow to direct at future value growth opportunities in Egypt and outside of Egypt. As a result of the recent de-risking of the area we refer to as South Harmattan, we can deploy capital in Canada, to achieve our production and cash flow goals in 2020 while we await finalization of our concession consolidation efforts in the Eastern Desert in Egypt.

What is the operational update on the South Ghazalat exploration?

Production was initiated at South Ghazalat on 24 December 2019 from the SGZ-6X well following the installation of production facilities at site. Initial oil production was in the range of a field estimated 800-1,000 bopd, however, the gas oil ratio rapidly increased to a level that interfered with the ability to separate oil from water in the facilities. This, combined with prudent management practices on the upper Bahariya reservoir completed in this well, has led to the well now being produced at a restricted field estimated 300-400 bopd. The lower Bahariya reservoir also tested oil in this well and remains a future recompletion target. We have a rig contracted to drill both a follow-up well in the 6X discovery pool as well as an exploration well in a prospect to the East of the existing discovery later this year.

What is the growth strategy of TransGlobe worldwide and in Egypt?

We are primarily focused on development and production with a core view of generating strong cash flows and long-term value accretion. By steering the bulk of the company's efforts towards stable production, we have been able to create a uniquely competitive position in the market. Given our strength in maximizing recoveries from under-loved and under-developed assets, we look to capitalize on our core skillsets to improve field rejuvenation possibilitiesby looking to expand our operations in Egypt or similar regions through synergistic acquisitions. Through this approach we hope to triple our production output and more importantly cash flow in the medium term. Having said that, having a little exploration success along the way is always welcome.

Do you see your recent success in Canada having you refocus to a more Canadian centered business going forward?

We re-entered Canada in 2016 in order to diversify our portfolio of development assets and gain exposure to the increasing technological advancements in North American drilling and completion techniques. Our Canadian re-entry was part of the Company's ongoing strategy of portfolio diversification into countries with attractive netbacks to support growth. This decision inevitably played to our core strength of value creation through development drilling and reservoir management. Recently, we have had some success in our South Harmattan area. This success provides more balance to our portfolio but we still see the real prize in the portfolio in the potential resources that could be pursued in the Eastern Desert if the Company has both the right fiscal terms and adequate time; which are the key elements of the restructuring work being discussed with EGPC.

How will your plans change if the recent fall in oil prices turns into a prolonged return to low prices?

We have been able to weather unpredictable markets by maintaining control over our own operations and focusing on opportunities where we can operate most efficiently. Because we are the operator of all our Egyptian assets and the majority of our Canadian assets, we can react quickly if oil prices shift materially. We're not forced to push ahead when it isn't favorable to do so and we can therefore control our costs accordingly. We believe there is potential for much stronger oil prices in the not-to-distant future and the key to success is being in a position to capitalize on those prices when they occur. We are also optimistic that the current sell-off in oil prices due to the potential for lower Chinese demand will be short lived.

You have recently had some key people in your organization depart and have added some new names, can you tell us a little about that transition?

After a 20+ year career with TransGlobe, Mr. Lloyd Herrick retired recently; Lloyd is one of the finest individuals I have ever worked with in my career. He was truly dedicated to our shareholders, our partners and loved by our employees, he will be dearly missed. In anticipation of Lloyd's retirement, we were fortunate enough to hire Mr. Geoff Probert last spring. Mr. Probert is a highly skilled professional Engineer with over 30 years of experience, much of which in North Africa including Egypt. Geoff has already made a valuable contribution to the Company assisting in the efforts of our consolidation and in particular advancing our understanding of the contingent resource potential within the Eastern Desert lands.

Finally, we would like to know about TransGlobe's ESG initiatives that you can share with us.

TransGlobe has been supporting the Ras Gharib hospital for many years, as a recipient of choice as suggested by our joint venture employees. Our production assets are close to city of Ras Gharib on the Gulf of Suez and a large number of our joint venture employees live in Ras Gharib and have a strong attachment to the hospital. In 2013, TransGlobe provided support to fund the establishment of the first intensive care unit at the hospital and we continue to support the unit with donations to fund the acquisition of specialist heart and lifesaving equipment on a regular basis. TransGlobe makes donations to the hospital whenever a significant HSE achievement is reached so that we are improving safety continually as well as supporting an essential local facility in Ras Gharib.

In addition to this, TransGlobe has 2 staff members on the CSR committee, which is a subcommittee of the Egypt Oil and Gas Technical Committee. Although only recently formed, this committee is already very active in liaising with other IOC's to share and align CSR activities across the industry.

We have additional plans to decrease our emissions in the Eastern Desert which will become viable once our consolidation efforts have been concluded. We look forward to discussing these with the industry, the public and our investors once we have concluded that consolidation.

For Tandem FLNG Offloading Systems". The design fo the hose has been developed through numerous numerical simulations, small-scale and full-scale tests at both ambient and cryogenic temperature. Today, the full-scale qualification campaign of the hose following the test program defined by EN1474 -2 standard has started and is expected to be completed in the second semester 2014.

Offloading LNG in challenging sea states

Beyond the need to have a fit-for-purpose floating hose, offloading LNG in sea states up to Hsof4m requires additional design and procedure adjustment. From a safety perspective, the floating hose allows increasing the distance between the vessels, which already provides more confidence to start such LNG transfer operations when environmental conditions are challenging. With such sea states, unless a very powerful (and expensive) assistance vessel is affordable by the project, it shall be possible to transfer the hoses from the LNG terminal to the LNG carrier without external support. To that purpose, the lifting devices for the hoses located on the LNG can drag the hoses directly from the LNG terminal: a messenger line is shot towards the carrier. Then, the handling wires can be transferred to the LNG terminal and be connected to hoses connection head.

The bow loading platform of the LNG carrier also houses a heave compensation system that guarantees a safe lifting of the connection head and the hoses even in the largest waves that can be encountered in sea states with Hs of 3.5m. Wind and current maximum allowable velocities are not defined by the tandem system, which is very compliant, but by the mooring/station keeping system of the LNG carrier. This system can either be based on a hawser kept taut between the two vessels or on the use of dynamic positioning system on the LNG carrier. It will be in charge of keeping the carrier bow within the angular sector and distance allowed by the operator, which is the normal practice for oil offloading in harsh environments. A typical operating envelope for the LNG tandem system based on OCIMF guidelines requirement ("Tandem Mooring and Offloading Guidelines for Conventional Tankers at F(P)SO Facilities") is illustrated in Figure 7. Again, the tandem system in itself does not bring any limitation to the size of this operating envelope thanks to the use of floating hose, as explained earlier.

Design of the storage system of the floating hoses

Storing three 200m-long hoses on a floating terminal is not a major challenge in itself. However, floating liquefaction plant hull size is usually driven by topsides dimension, which means that any space saved on the hull deck represents significant savings on the CAPEx of the facility. Therefore, instead of storing the three hoses on separate reels, a single innovative and compact hoses storage system was designed for these three hoses. Each hose is reeled on its own horizontal rotating plate above one another. A central shaft supports the three stages (Figure 8).

This reel presents other merits: almost the whole surface of each hose can be inspected, contrary to the traditional reels. The hoses can be gravity drained instantly if they are reeled back full of liquid, whereas traditional reels create several low points where liquid can accumulate, slowing down significantly inerting operations. Finally, the reel configuration simplifies the synchronous unreeling operation of the three hoses together when deployed with the common connection head. And in case one hose needs some maintenance operations, it can be disconnected from the connection head and remain un-deployed on the reel.

The reel being made of standard mechanical components, qualification activities focused on validating that the reeling process was not inducing excessive loads on the hoses or torsion phenomena. A 1 /10 scale mock-up of the storage reel was built, together with representative dummy hoses, respecting the similitude with the final hose in terms of geometry of each hose section and mechanical properties (Figure 9). Tests demonstrated that the reeling process does generate any torsion in the hoses and that the crushing load induced by the reeling process is fully acceptable for the hoses. It was also observed that the reeling operation naturally untangles the hoses, should large waves bring them above one another during the LNG transfer thanks to the common connection head.

The connection head: a component improving the safety of operations

The tandem system has been designed to provide inherent safety throughout all the phases of the transfer operations. For example and as explained above, the hoses have an integrated leak detection system that enable to identify if a leak is taking place and the precise location of the leak. Moreover, safety of operations is also improved by the fact that no assistance vessel is needed to operate in the vicinity of the terminal and the carrier, thus limiting the risks of collision. But one of the key safety components of the system is a common connection head at the end terminations of the three floating hoses (Figure 10). This connection head improves the safety of the marine operations by:

- Reducing the duration of the phase where hoses are transferred from the LNG terminal to the LNG carrier by transferring them at the same time. Indeed, this phase is the most critical marine operation of the offloading sequence and saving time there reduces the exposure to weather degradation for example.
- Prevent entanglement of the hoses: having a common

floating connection head significantly decreases the risk that hoses get above one another in case of bad weather conditions. Even in the unlikely event of the connection head overturning, the reeling process will naturally bring it back to its normal configuration.

- The end ball valves housed inside the connection head are protected against impacts with most potential floating objects thanks to the external armature built around them.
- Finally, the connection head includes a by-pass line and valve between the two lines supposed to transfer LNG. In case of emergency release of the hoses and their connection head, the by-pass valve can be opened. In that case, despite the physical disconnection with the LNG carrier, it is still possible to create a loop between the two liquid lines and flush them immediately, thus removing most of the LNG inventory before reeling the hoses back on the LNG terminal.

Tandem Offloading System qualified following EN1474 -3

The proposed design of the tandem offloading system has been supported by qualification actions on items that were presenting some novelty (usually existing components used in a new application) and an exhaustive engineering design validation. The qualification has been validated by Bureau Veritas granting the system with a Concept Approval Certificate, in accordance with EN14743- and BV NR 542 standards, in 2013. The cryogenic floating hose is expected to receive Type Approval Certificate following EN1474 -2 standard in the second semester 2014. The engineering design performed covers in particular the structural and piping design, the control system specification & logic, the operating procedures, as well as the hydrodynamic analysis of the complete offloading sequence, including the phases of transfer and retrieval of the connection head and the emergency release of the hoses. Therefore, tandem offloading with floating hose will soon be an applicable solution for FLNG and FSRU loading and unloading operations.

Figure 1—Side-by-side LNG offloading operation on FSRUToscana

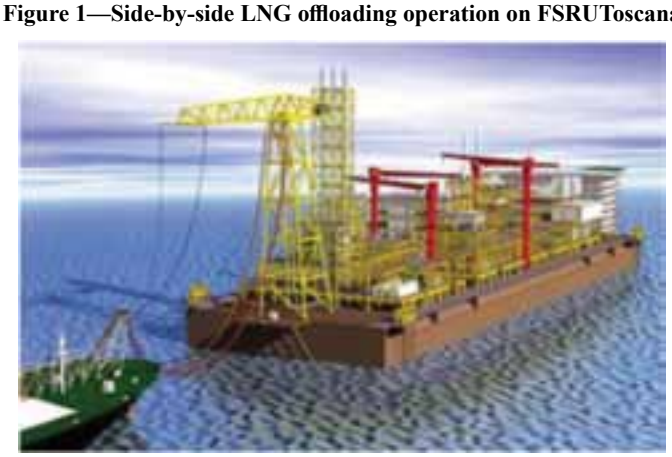


Figure 2—Example of aerial tandem configuration

Figure 3—Tandem Offloading System with Floating Hoses

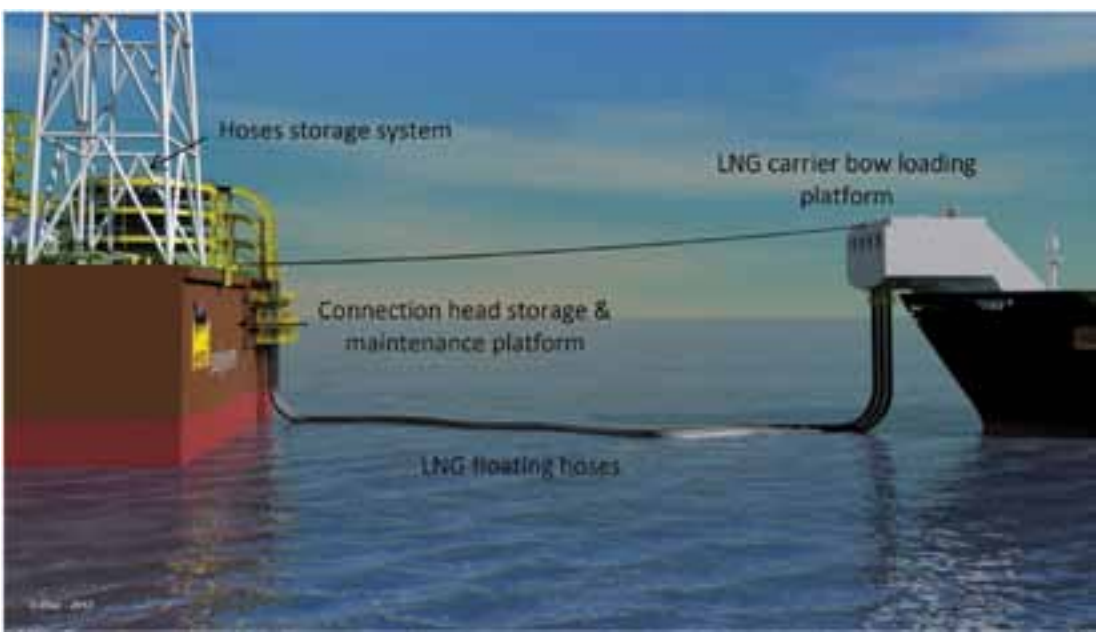


Figure 4—Tandem offloading system main components

Figure 5—Cryogenic hose components

Figure 6—Manufacturing process of the inner composite hose prototype

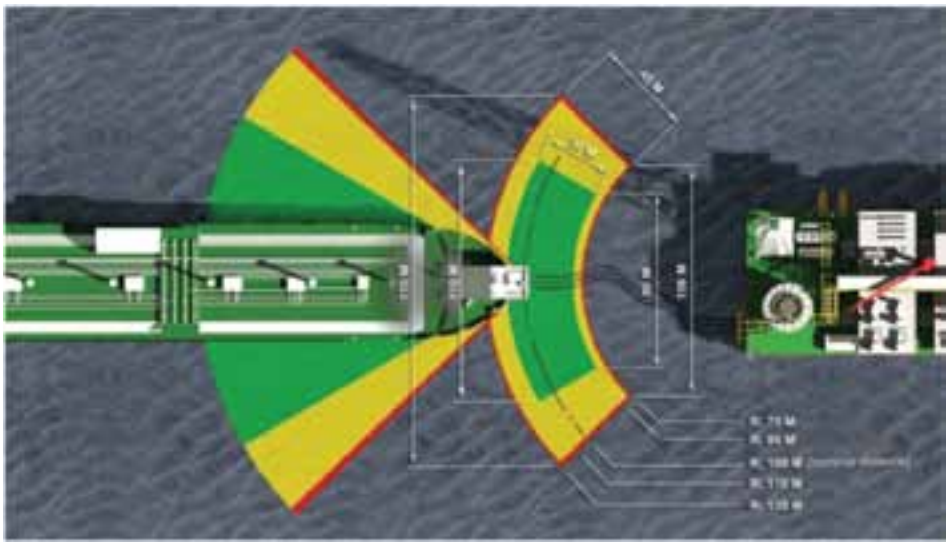


Figure 7—Typical operating envelope of the tandem offloading system with floating hoses (taut hawser mooring)

Figure 8—Hoses reel storage system and the connection head maintenance & storage platform

Figure 9—Reeling tests

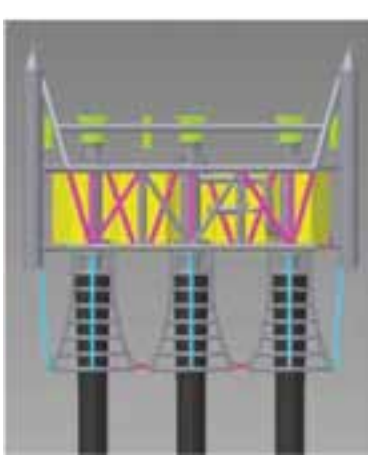


Figure 10 - Connection head during lifting operation

An Automation Engine to Improve Seismic Operations in Exploration

By: Mohammed Almiyad and Anas Alhasan, Saudi Aramco

Abstract

One of the challenges faced in the seismic exploration field is the increasing demand for massive digitalstorage space and High Performance Computing (HPC) resources. Geoscientists require uninterruptedaccess to these resources in order to submit jobs that process seismic field data. These jobs are typicallybatched together using one of many off-the-shelf job scheduling solutions available in the market. In manycases, these jobs consume large amounts of space in a short period of time, potentially causing other jobsto be halted or fail. This paper presents a solution that intelligently monitors these jobs and takes actionswhen needed to mitigate the risk of job failures.

The solution is an automation engine that is designed and developed in-house. The engine integrateswith the job scheduler and the High Performance Storage (HPS) systems. It consists of four modules:Monitoring, Data Gathering, Job State Management, and Notifications. The engine monitors the digitalstorage space consumed by seismic jobs. When predefined utilization thresholds are breached, it collectsand analyzes jobs data stored in the job scheduler. Based on the results of the analysis, appropriate actionsare performed to prevent job failures, and concerned parties are notified. The paper will explain each moduleof the automation engine in detail, and how they work together to achieve the goal of the automation engine.

After deploying the automation engine, response time was reduced by more than 80%. The manual,lengthy and cumbersome process to verify and perform required actions is completely automated. This hasled to improved accuracy, eliminated human errors, and resulted in better manpower utilization. Moreover,potential job failures due to slow response times is minimized. This proactive approach of monitoring,alerting, and actioning capabilities has allowed users to free up storage space before reaching a critical statethat results in costly job failures and wasted CPU hours.

The automation engine provides new functions that complement the job scheduler without compromising performance. While job schedulers are responsible for assigning jobs to available resources, they still needto perform custom health checks before running the jobs, which can be expensive. The automation engineperforms these checks and monitors critical pieces of information in order to take actions accordingly.

Introduction

Seismic data are raw wave signals collected by geophones to map the subsurface. These data are collectedby trained seismic field crew members using special devices and techniques. The collection method usuallyinvolves generating seismic waves from a source, then measuring their travel time from the source until theyare reflected back to the surface. These readings are then used to construct an image of the subsurface. Thismethod is used extensively in hydrocarbon exploration in the oil and gas industry to identify potential fieldsfor drilling. Once seismic field data are collected, they are usually stored in large capacity tapes and sentover to a scientific center for processing. Geoscientists use multiple methods to interpret the data, removenoise and generate clear geological representation of the targeted areas. This step usually requires supercomputers, or HPC clusters, along with HPS systems. [1]

One of the challenges in HPC, and cloud computing environments in general, is job scheduling. Resourcesin these environments are limited, and ultimately incoming jobs will end up exceeding available resourcesand waiting in a job queue. There are many scheduling algorithms and techniques that can be used to decidewhich job from the queue to run first once resources become available. The best scheduling algorithm to usewill depend on the nature of these jobs, but the end goal is the same: schedule jobs in the most efficient way,and maximize resource utilization. Many organizations opt to use one of the many off-the-shelf schedulingengines, whether open-source or proprietary.

Seismic processing requires powerful computers, while

also generating huge datasets [2]. As such, thetechnology infrastructure for seismic processing usually consists of an HPC cluster, along with associatedHPS. In order to optimize system utilization and reduce cost, multiple seismic processing jobs are configuredto run on HPC clusters and utilize the storage space provided by the HPS. Since the HPC cluster resourcesare limited, the need arises for a scheduling system that assigns available HPC resources to incoming jobs[3]. The scheduling engine will receive submitted jobs and takes care of assigning available HPC resourcesto these jobs based on their demands, while queueing other jobs until HPC resources are freed. Dependingon the size of the job, some can take hours to complete, while others may take days or weeks. When a jobstarts running, it will generate data that are stored in the associated storage space. This storage has massivecapacity and can handle higher input/output rates, but it is also shared among other jobs. In some cases, ajob may start generating huge amounts of data in a short period of time, thus filling up the shared storagerapidly to its limit. When this happens, other jobs will be unable to write to the storage space anymore,and they will all fail. These failed jobs may have been running for days or weeks, consuming valuable andexpensive CPU hours, which results in delays and wasted resources.

One solution to minimize this risk was implemented at Saudi Aramco. The shared storage space is dividedfurther into project directories, called «Workorders». Each workorder has its own quota, thus limiting theimpact on other projects when it gets filled up. However, the risk of one job filling a workorder and causingother jobs in the same workorder to fail is still there. In this paper, we introduce a solution that intelligentlymonitors these workorders, and takes automatic actions when needed to mitigate the risk of jobs failures.

Quota-based Workorder Monitoring

The introduction of quota-based workorder utilization has improved the efficiency of disk space utilization.However, it also introduced an extra overhead on the 24 / 7 console operations staff. Prior to this solution,operators used to monitor a handful of root filesystems, which are used by all projects and users. Oncethe quota for a filesystem is exceeded, all jobs running on that filesystem are held, and the filesystem ismarked unavailable for the HPC job scheduler. With the workorder solution, console operations staff becameresponsible to monitor a large number of workorders in addition to root file systems. In addition, when aworkorder utilization reached a critical threshold, they would manually filter through hundreds of jobs toput them on hold, and do the same to release them when workorder utilization returned to a safe level. This process can be tedious, time consuming and error-prone. This is where the automation engine comes intothe picture.

The Automation Engine Architecture

The automation engine consists of three in-house developed modules, as well as three off-the-shelf systems.The three systems are the HPS system, the HPC job scheduler, and the monitoring system. The in-housedeveloped modules are the Workorder Monitoring module, the Notification module, and the AutomationEngine Core module (Figure 1). These three modules integrate seamlessly with the three systems to formthe automation engine system. The details of the integrations are shown in Figure 1 and described hereafter.

The first integration is with the HPS system, which manages storage requirements. This includes creating,configuring, and deleting filesystems and workorders, as well as defining quotas based on user requirements.The automation engine integrates with the HPS system to query workorder data and utilization in nearreal-time. Then, it reads the data to detect which workorders are breaching utilization thresholds, decide ifactions need to be taken, and ensure the HPS system and the automation engine are synchronized by adding/deleting new or obsolete workorders.

The second integration is with the job scheduler, which manages the job queue and assigns availableHPC resources to jobs. The job scheduler also stores metadata, parameters and other important informationabout the jobs, whether queued, held or running. The automation engine has two-way integration with thejob scheduler. First, it fetches detailed information about all the jobs on a particular workorder. This allowsthe automation engine to take appropriate action and decide which jobs to hold, release or edit as needed. Second, when holding jobs, the automation engine writes to the job scheduler and puts special tags on theheld jobs so that they are distinguished from others jobs.

The third integration is with the Monitoring System, which monitors all IT infrastructure in the datacenter. The automation engine includes a workorder monitoring module that leverages the capabilities ofthe monitoring system and its access to all required resources. In essence, the monitoring systems acts as ahost for this module. Information such as the predefined warning/critical thresholds, and the triggers to holdand release jobs are all configured in the monitoring system and used by the automation engine to performthe required actions. In addition, the module also updates the workorder monitoring configuration in themonitoring system to ensure they are in sync with the HPS system.

The Notification module is responsible for notifying all concerned parties of important events and actions.There are three types of notifications. First, when a workorder is filling up and reaching a warning state, users are notified to free up disk space. If the workorder continues to fill up and reaches a critical state,jobs are automatically held and details of all impacted jobs are sent to users. Finally, when

the workorderutilization goes down to a safe level, jobs are automatically released and users are notified accordingly. Console operations staff are included in all notifications to verify the accuracy of notifications and actionstaken by the automation engine.

Results

The automation engine has significantly reduced the time taken to hold and release jobs, as well as to stopand start workorders and filesystems. On average, manually holding and releasing 1,000 jobs used to takearound 30 minutes, while it only takes 2 - 5 minutes now, reducing the time taken by more than 80%. As jobsare held promptly, this minimizes the risk of job failures. Likewise, releasing jobs as soon as the environmentis healthy again results in improved system utilization.

Manually performing these actions requires the full attention of a console operations staff member, andcan be stressful and cumbersome. The automation engine eliminates the possibility of human errors anddelays, and completely automates these actions. This takes some of the load off console operations staff andallows them to focus on other important tasks.

Automating these time-sensitive, time-consuming and critical actions has led to faster response time,better system utilizing, minimized risk of job failures, eliminated human errors, and generally improvedservice availability.

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Conclusion

In this paper we presented a solution to some of the major challenges faced in the seismic processingenvironment. The automation engine improved response and resolution times by 80%, eliminated the needfor human intervention to perform these manual actions, and minimized the risk of job failures. In future,we plan to incorporate Machine Learning techniques into the automation engine to be more proactive inpredicting job behavior, and taking preventive action.

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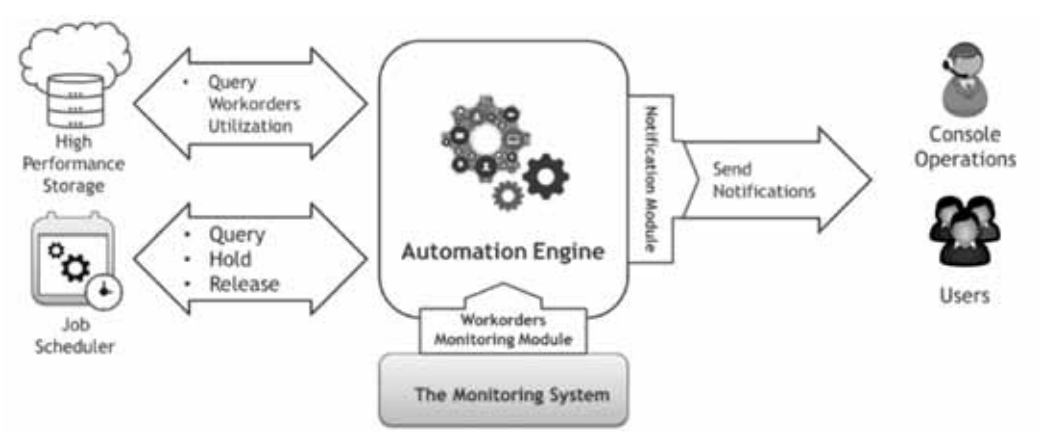

Figure 1—System architecture of the automation engine

Table 1—Time taken to Hold/Release Jobs – Manual vs Automation

Workorder running 1,000 jobs		
	Manual (minutes)	**Automation (minutes)**
Hold	~30	2~5
Release	~30	2~5
Total	~60	4~10

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Development of Requirements for Safer Operations of FLNG Units

By: Tor-Ivar Guttulsrød, ABS

Abstract

Floating Liquefaction Natural Gas units, or FLNGs, have matured as a technology in recent years with Petronas, Golar, Shell and Exmar units coming on-line. Additional units from Petronas and ENI are under construction.

The challenge with integrating elements of onshore LNG production plants, LNG shipping and offshore floating production and offloading (FPSOs), into one floater with limited space and load bearing capacity, was significant, necessitating the development of design guidelines.

The traditional approach to mitigating the impact of fire and explosion risk in an onshore LNG plant is to use physical separation between the various elements of the plant. In addition to potentially reducing fire ignition and escalation potential, this can facilitate personnel egress and allow for additional leak containment to be incorporated.

With production, liquefaction and storage integrated in one unit, there is very limited opportunities for using space segregation as a safety measure within the unit. Also, when the cryogenic fluids offload to an LNGC in a side by side configuration with the FLNG there is also no opportunity to segregate the loading carrier from either LNG storage, production or liquefaction.

With this background, regulatory regimes and class societies have leaned heavily on the guides and rules for FPSOs and integrated significant elements from LNG shipping, particularly when it comes to LNG cargo containment and offloading.

Every potential FLNG location with corresponding metocean and meteorological data as well as fluid flows and compositions will be different, so it is very difficult to create prescriptive rules for separation distances etc. As a result, it is typical to quantify and mitigate risk through analysis and studies and use the ALARP (As Low As Reasonably Practical) principle when reviewing risk mitigation efforts.

This paper will show how the different standards and rule sets are brought together as a comprehensive regulatory approach. Standards and class rules are utilized to bring together an approach that results in a design and construction that satisfies the needs of flag, class, coastal state and owner. To this date floating LNG facilities have been able to safely carry out commissioning and start up and produce and deliver cargos without major incidents. The track record to date also highlights how the technology can be used in harsher climates and seas and hence can unlock more gas reserves.

Introduction

Floating Liquefied Natural Gas (LNG) production units (FLNGs) have been contemplated seriously for almost three decades. It was however not until Shell made a final investment decision for the large Prelude floater offshore Australia in 2011 that the long and windy road of making floating LNG a reality came to bear. With Shell as a major energy player and the emergence of the energy transition, the debut of floating liquefaction and offloading offshore was kickstarted.

In the past, gas was a byproduct that was not always desirable and in the earlier days flared off at the producer to focus on the oil production only. This is however not often the case anymore and the demand for gas is growing as a substitute for coal and oil in power production, fuel for transportation and as industrial feedstock. It is therefore prudent to have workable solutions for production of gas offshore and transport means to bring it to the consumers. Floating liquefaction indeed can be one of the options for bringing the gas to its consumers, and possibly also in the preferred state as a liquid. Floating liquefaction typically is a preferred solution if it is challenging to pipe the gas due to distance, water depth, pipelaying difficulties or a combination of these. Another element that can push towards FLNG rather than onshore plants is remoteness, as a significant benefit of a floating plant is that it can be built in a controlled environment in a shipyard.

Floating Gas Production

Gas has been produced offshore as both associated gas and gas reservoirs from both fixed and floating structures for a long time. If the distance to the market for the fuel or feedstock was too far or too deep to be reached by pipeline, alternatives such as liquefaction, chemical conversion to liquids as methanol or synfuels, or compression for transport as Compressed Natural Gas (CNG) could be considered.

Production of gas offshore has basically followed the same rules and practices that had been adopted for offshore oil production. Initial offshore production as well as current shallow water production do not include hydrocarbon storage, and it was only when FPSOs (Floating Production Storage and Offloading units) entered the stage that hydrocarbons were stored offshore at the location it was produced and the product was exported by means of ships. The first FPSOs were conversions of oil tankers to floating production units and conversions still has a significant market share in the floating production market.

With conversions of tankers to production units which had been designed and built to marine transportation requirements, the regulatory requirements had to be adopted to blend the production rules that generally are applied to the production facilities with the marine requirements for the hull and tank structure or storing the hydrocarbons. This has to be done without causing conflicts between the rule sets and also ensuring that the entire unit is covered and nothing falls in the cracks between the production and marine elements.

Cryogenic Offshore Units

Traditional FPSOs do not have cryogenic processing or storage onboard. Crude is heated and flashed and the vapors evolving are only treated to condense heavier components and water before being injected into an export pipeline or into a reservoir for pressure maintenance of the reservoir.

Feedstock compositions from different reservoirs differ, but several cases emerged where there was a significant amount of LPG in the wellstream, in fact so much that you could not leave it in the stabilized crude as this would violate the vapor pressure specification and you could not leave it in the gas as this would give too high a heating value or Wobbe index. LPGs are valuable feedstock for petrochemical and is also used for fuel etc., so the search for a viable LPG export solution from offshore facilities was on.

Emergence of FLNG

There has been a search for a viable, safe and cost-effective solution for producing what used to be deemed stranded gas and bringing it to market. Gas is often used as fuel for power generation and gas has gained more prominence in this sector the last few years given that gas is the cleanest burning hydrocarbon and as such is part of the energy transition away from more polluting fuels. Many desk top exercises were carried out, but one needed a cost effective and safe solution that encompassed processing, storage, and liquefaction of LNG at typically −162°C. This demanded new steps in technology as well as merging technologies from onshore gas processing and liquefaction, offshore production and processing from the upstream energy business and LNG storage and offloading from the LNG shipping business.

The regulatory environment for these units also needed updating and adaptation to ensure that all issues related to cryogenics and large inventories of gas and pressurized gas are fully addressed and that there is a seamless transition between the hull and the topside facilities from a regulatory framework point of view.

Regulations and compliance of these will have to be coordinated to encompass the requirements of class and flag and the regulations that follow these bodies as well as the requirements of the local shelf state where the units are intended to operate. Some assistance in moving this forward was gained by the advent of floating regasification units, although most of these units are classed as ships and not as facilities. These units did however move forward the concept of a floating unit with integral LNG Storage, ship to ship transfer of LNG and simple process onboard as the LNG is vaporized before being sent ashore to feed the grid or local consumers.

Production and Gas Treatment

Gas production and treatment for water and hydrocarbon dew-point control for export or re-injection are commonplace in the upstream oil and gas business. There are however two types of FLNGs which face rather different operating conditions.

The initial FLNG by Shell and the two that followed from Petronas as a major energy company was true offshore units with full wellstream processing onboard and the ability to export two or three hydrocarbon liquids.

Another type of FLNG, which seems to have grown in prominence recently, is the nearshore or at shore units which basically are fed pipeline quality gas, treatment, liquefaction, storage and offloading are the main functions of these units. These are typically simpler as they don't see the full wellstream and hence only handle LNG as single product and they are predominantly moored at a jetty or close to shore so that they are sheltered from the roughest seas and it is easier to resupply materials etc.

A key element in the pre-treatment before liquefaction is

to preprocess the gas so that it is liquefaction ready. This conditioning has much more stringent requirements than traditional FPSOs in order to prevent hydrates and slugging in pipelines or the intermediate step when liquefying propane and butane. Propane has a boiling point of −44C at ambient and average LNG around −162C, so naturally the degree of water, acid gas and heavier hydrocarbon removal is a lot more stringent. There had been concerns around consistently meeting such stringent gas quality specifications for liquefaction on a floater considering the motions, particularly for the amine system for H2S and CO2 removal. The CO2 removal requirement is to remove CO2 down to 50 ppmv. This is typically done with countercurrent flow where the wet gas flows countercurrently with the amine which absorbs the acid gas molecules.

From a class and safety perspective the off-gas from the amine unit is of particular importance as this would contain H2S, mercaptans etc. and these substances, hydrogen sulfide in particular, is poisonous. This stream is also wet and hence corrosive as the amine solution is aqueous and handling requires care and this needs to be included in the design and planning for safe operations.

The final step in the gas conditioning is gas dehydration to a dewpoint low enough to prevent any hydrate or ice formation in the fluid during liquefaction. Water removal to such low dewpoints is typically done in molecular sieves, which also have been chosen for FLNGs. These units are vessel filled with molecular sieve pellets which are hygroscopic. There are normally a few vessels in parallel so that one vessel can be taken offline at a time and regenerated by passing warm natural gas counter currently through the bed.

The regeneration gas is another gas stream that needs careful attention as the warm regen gas will sweep whatever co-adsorbed with water on the sieves off as well. This may also contain some sulfur compounds.

After the sweetening and dehydration the gas is conditioned for liquefaction. Depending on the preferred pressure for liquefaction, it is not unlikely that the sweet and dry gas is compressed before entering the liquefaction system so that it enters the liquefaction system at optimum pressure.

Liquefaction and Storage

There are many different types of liquefaction system in use in onshore LNG plants. When considering use of liquefaction processes offshore, there are several key factors to consider as the restraints when it comes to motion, available plot space and load bearing capacity of the substructure. When liquefaction offshore was just a paper exercise, the liquefaction process selection was one of the main focus areas.

Onshore LNG liquefaction has focused largely on economy of scale and thermal efficiency the last few decades. The offshore application of the same technologies changes focus here. Start up, continuous operation and shut down will have to be as operational friendly as possible. The process needs to be robust with respect to changes in weather, the marine environment and associated motions without losing the ability to produce LNG to the desired specification.

A key driver offshore is to drive down the equipment count, as this impacts complexity, weight and cost and in turn reliability and safety as well. For this reason, single mixed refrigerant (SMR) and dual nitrogen cycle processes have come back into vogue with the advent of floating liquefaction. Another element that makes SMR and nitrogen liquefaction processes suitable for the offshore environment is easier adaptation to changes in the feed gas composition.

The other process that has been selected for offshore is dual mixed refrigerant (DMR), which was picked for Shell's Prelude and Eni's Coral Sul. Both Prelude and Coral Sul have larger production of LNG and hence the tradeoff between more complexity with better thermal efficiency makes sense. Both of these units are also designed with one target field with a fairly well-defined feedstock composition, and hence the liquefaction process can be finer tuned to a specific gas composition. Tuning of the mixed refrigerant process does however mean modifying the composition of the refrigerant for better matching of heating curves in the large heat exchangers. The practical implications of changing the composition of the refrigerant is however increased complexity, as either additional refrigerants are produced onboard from the wellstream and nitrogen generators or they are imported. This additional refrigerant equipment and associated inventory will have to be considered in safety assessments and operating philosophies.

Onshore LNG storage is typically done in above ground tanks away from the process area. This is not feasible when the cargo is stored in the hull and the production facilities and liquefaction sit above deck of the same floater. Risk based analysis is therefore used to address acceptable risk profiles for placement of equipment versus storage and cargo handling. Another element with respect to storage onboard a vessel compared to a land based plant, is motion. A floating installation will be impacted by the motions of the sea, and the cargo containment system will have to be able to handle the forces from sloshing liquids in the tanks as well as handle the increased boil off resulting from agitation of the fluids in the tanks. To date three different versions of containment systems have been used for FLNGs, all systems that have been used in LNG carriers; Type C, Type B (Moss) and membrane. Type C is basically a pressure vessel and the sizes are limited, so sloshing is not an issue but a type C

containment system is not volumetrically efficient and best suited for smaller applications, hence it is no surprise that is used in the Exmar Tango FLNG Barge.

Type B tanks are typically sloshing resistant. There has been a few type B SPB concept designs, but no FLNGs with SPB tanks have yet been built aside from the Exmar regasification barge. Moss Tanks, also type B, has however been the choice for Golar's conversion projects. Moss tanks are resilient when it comes to sloshing, but due to the spherical shape of the tanks, sponsons was added to the side of the vessel to create additional space for topside. Finally, membrane tanks, which is the most popular choice in LNG carriers, have been used in Shell's Prelude, ENI Coral Sul and both of Petronas' FLNGs. In order to alleviate sloshing concerns for membrane tanks in partially filled conditions, the membrane system is reinforced and a central longitudinal bulkhead is introduced so that the free surface area of each tank is smaller.

Offtake of LNG and LPG

Onshore LNG plants typically have large onshore tanks, pipelines to the waterfront and on to a jetty where LNG carriers are loaded by means of cryogenic loading arms connected to the ships midship manifold.

When both the terminal and the visiting tanker are floating, this introduces new challenges that one must be implement in design and operation.

Produced oil from FPSOs is typically discharged to either conventional tankers or purpose build shuttle tankers in tandem configuration. The harsher the environmental conditions, the more demands there are on the shuttle tanker, hence there is no surprise that the most sophisticated shuttle tankers are found in the North Sea with both bow loading systems and dynamic positioning systems. On a global basis, the most common approach for loading from FPSOs. This approach is not directly transferable to LNG due to several elements:

- Long lengths of deep cryogenic hose needed,
- Vapor return of boil of from LNG being close to its boiling point,
- Possible sloshing issues in exporting LNG ships,
- Development economics with field specific LNG shuttle tankers with bow loading and DP.

The current approach to avoid these issues and avoid needing a bespoke LNG shuttle fleet to serve FLNG projects has been to adopt ship to ship (STS) transfer for all projects in operation or under construction.

The STS operation is carried out either by means of hoses or loading arms and both approaches do require a vapor return connection so that gas displaced by incoming liquid and vapors generated during flashing during loading is returned to the carrier.

The ship to ship transfer of LNG was pioneered with FSRUs (Floating Storage and Regasification Units) and has been adopted to all FLNG projects so far. However, bringing the LNG ship and the FLNG unit together and moor the ship to the installation do set some limitations on the sea state during approach and mooring as well as during transfer. The most challenging part of this operation is the approach and connection, hence the most stringent requirements apply during this phase.

Development of FLNG Regulatory Environment

The regulatory environment for floating liquefaction has been based on the framework for FPSOs. In the current environment, most regulatory bodies see FLNGs basically as LNG FPSOs and treat them as such.

For each local production province there is typically a matrix of different regimes that needs to be satisfied and for floating production units, classification is normally has a central role. In addition to class, the operator and developer will have to satisfy flag and shelf state requirements. Flag is often either the flag of the country of operation or a flag of convenience. Another element that needs to be clarified, is under which regime an FLNG unit will be permitted under locally. In the US Gulf of Mexico for instance, a nearshore unit would be permitted by the Federal Regulatory Committee, FERC, whilst a true offshore unit more than 12 miles from shore will be permitted under the Deepwater Port Act, MARAD NVIC and lead agency will be the US Coast Guard. This regime is tied to the export permits of LNG and Bureau of Safety and Environmental Enforcement (BSEE) is not the agency in charge as all units considered so far in the US contemplate using onshore gas, whilst BSEE oversees exploitation of resources from the Continental Shelf. Coast Guard would however be instrumental in both a BSEE approval scheme for an offshore FLNG with wells on the seabed as well as in a MARAD scheme with onshore gas being piped offshore for liquefaction.

For classification of floating installations, including FLNGs, there is an option whether one want to build the topside processing facility to class rules or apply class only to the floater and safety systems. Class of the topside can play an integral part of the local permitting, and this is an approval which most local regulatory bodies are familiar with and hence can play a part in satisfying shelf state requirements as well.

In order to get the regulatory approach on the right track, it is recommended to start considering the regulatory elements of

your project in early stages of the project. Class can provide valuable assistance in this phase and help develop the regulatory compliance matrix and keep a dialogue with the local regulatory body. This approach along with the stage gate process and types of help class can give is shown in the diagram below.

Current Status of FLNG Regulatory Regime

The guidelines for FPSOs are typically being followed for floating liquefaction as well. Class approval is an integral part of the regulatory framework. With the variety of types of units, different locations and climates etc., it is very difficult to create prescriptive rules that fit all. Additionally some of the prescriptive rules that traditionally has been employed, for instance onshore LNG storage, does not work well for an FLNG as a marine installation, with cargo storage in the hull and gas processing and liquefaction on decks above the storage areas. For these reasons probabilistic tools as well as different types of risk analyses and workshops are used to demonstrate the safety of the design within acceptable safety criteria. It would indeed be very difficult to mandate a certain fixed distance between modules for units of different sizes and flows, different pressures and temperatures and different local climates.

Against this backdrop, FLNG units are in essence been treated as FPSOs with additional considerations to processing, storage and offloading of cryogenic fluids.

Lessons learnt

Many project developers were cautious in wanting to apply FLNG in their project portfolio, initially until the first investment decision was made and then until the first operational track record has been established.

A major point of interest had been regularity and uptime of the processing unit and ability to offload cargo so that production would not have to be choked or stopped. Publicly available data indicates high availability of the facilities and many cargoes have been offloaded and hence one has not had to worry about shutting down the process and possibly warming up the cold process kit until one could commence production again.

Hence, there should be less worry about these elements in new projects.

Also, when bringing liquefaction offshore, quite a few engineers and contractors that were not used to working in the marine space and on a moving foundation, had to adapt. These players have now undergone this transition and it should be a lot easier to start a new project compared to the initial one, particularly with dealing with the cryogenic elements in design and operation.

The International Gas Carrier Code (IGC Code), is the international standard for LNG ships and not too many years ago this standard was also updated to include regasification vessels (FSRUs). The IGC code is still not directly applicable to FLNGs, but it is often used as a reference standard, and the publisher of the IGC code, SIGTTO, is now in the process of publishing a guide for Floating LNG installations. Members of SIGTTO contribute to these documents, and hence information from designers, builders, operators and technology suppliers are integrated into the guide and this should also help streamline future projects.

Likely new developments

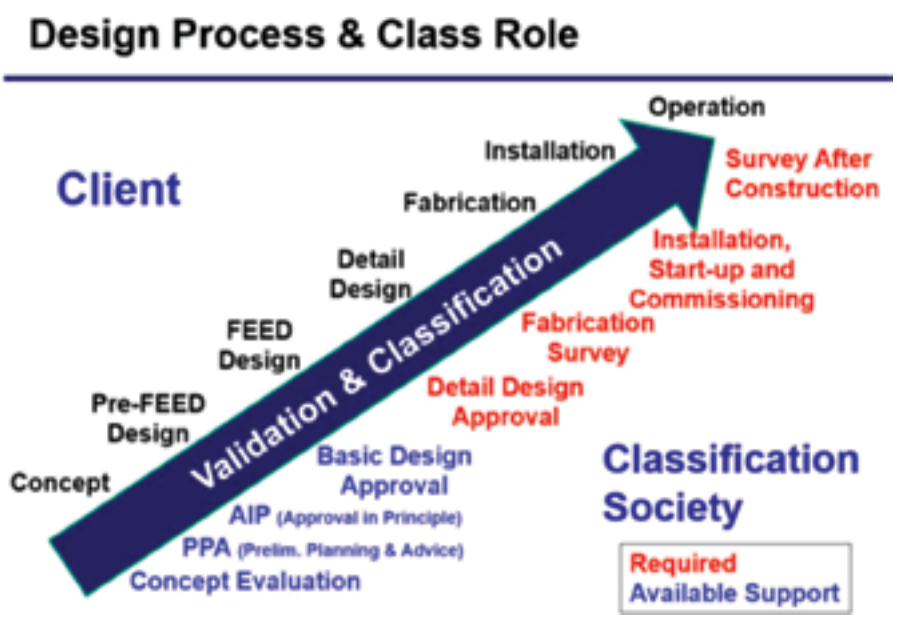
In the near term it appears as there will be plenty of supply in the global LNG market, but it is not a given that the LNG is available in the location where it is needed so on a short term basis it is likely that small to medium scale liquefaction in regional markets close to the customer will help move forward technology advances that can make small and medium scale FLNG more commercially attractive and help make more regional floater projects viable.

In the longer term, it is likely that gas in harsher weather environments will have to be developed and if these are far from shore or in deep water, it is likely that FLNG will be among the competing technological solutions. In order to ensure timely offtake of products from a floater in a rougher met-ocean climate, new technologies will have to be commercialized. A likely candidate here is the commercialization of tandem offloading of LNG. A key element that was missing before, the cryogenic floating LNG hose, is now commercially available although with limited track record at this point.

Conclusions

Floating Liquefaction has now become reality with units in operation, which also should allow for more seamless development of future new FLNG projects. To date FLNG has adopted a combination of experiences from floating oil and gas production, LNG shipping and onshore gas processing and liquefaction. This adaptation was done with care by the different players involved in the projects and so far projects executed has been performing well. Classification societies were on the forefront developing guides and rules for FLNG, and going forward, it appears as international industry groups as well as local regulatory bodies and maritime flags are amending their rules to include the additional functionality required by floating liquefaction units. This should minimize project and safety risk going forward as rules and guides will be more encompassing and it will not be needed to pull in many different standards and ensure the best integration of these.

Belanak Natuna Full field production with gas treatment and cryogenic processing. Courtesy of ConocoPhillips



Petronas Dua (FLNG 2) Courtesy of Petronas

The Global LNG Price Trend and the Role of LNG in Balancing the Gas Demand in MENA Region

By: Mohamed El Shahati, Haidar Khadadeh, and Fajer Al-Aradah, Kuwait Foreign Petroleum Exploration Company

Abstract

This paper analyses the role of LNG in balancing the natural gas demand in the MENA region. Natural gas is increasingly becoming a main energy source in the region due to several factors. The global LNG pricing mechanism is changing towards flexible market related methods that might encourage some countries in MENA to switch to LNG supplies. The growing requirements for natural gas as a fuel for electricity generation is estimated to be the driving force behind the growth in consumption of the hydrocarbon.

Contrary to wide held belief several countries in the region could fall into deficit regarding their self-supply of gas which would require them to import it. The options of supply are either through pipeline networks or LNG. The study estimates the future demand of natural gas by country using multivariate regression and then compares it to the availability of gas as estimated by GEFC. Deficit is derived for each country and the study indicate how the deficit could be filled through pipeline or LNG.

Keyword: MENA, Natural Gas, LNG, Electricity generation, GDP

Considerations and assumptions

The MENA area has been lagging in switching to natural gas consumption despite the huge reserves it owns.

This might be a cause of many technical, economic and political factors which we will discuss in the paper.

Switching to natural gas especially in power and electricity generation has been the distinction change in the global energy market for the last three decades. In addition to the economic incentive as natural gas is priced discounted to oil, environmental protection push has been a great influence to expedite the switch away from oil, also from coal and nuclear energy.

The natural gas market has coexisted with the global oil markets on regional patterns. This comes as the drive to switch are different among the regions due to technical and cost factors. Main industrial centres financial attracted gas importation from gas producing regions due to the wide difference between domestic and international values. During the 1980s Western Europe has attracted the Russian gas which was piped through Duzbura pipeline network originally built to satisfy the Communist Block in Eastern Europe energy needs. Far East mainly Japan has used their powerful purchasing power to lock many gas producers in MENA and beyond in LNG long term contract scheme.

The oil-gas price spread during the period 1980 - 2005 did not provide a strong economic incentive to MENA oil producers to substantially switch from oil-based power generation to gas based method. Since 2005 as oil prices have decoupled from gas prices and registered a wide positive spread which exaggerate the loss to oil producers from continuing to depend on oil for power generation.

Non-oil MENA oil producers or small oil producers have attempted to minimize oil consumption in particular in power generation sector by switching to gas or even coal during the period. Switching to gas for them has been hindered by economic difficulties and financing problems. Limited attempts to import LNG to balance energy needs have been carried out in the region. The possible reason for this is the inability to finance investment requirements for LNG receiving and then gas distributing facilities.

While it attempting to assume that the region could be a semi self-contained pipeline supplied region, many obstacles are hindering the realization of a perfectly pipeline traded gas. The gravity of the European and Asian markets for the gas producers is a main reason that makes the gas producers

overlap small consumers in the region by focusing on LNG trading scheme. Also, the political conflicts between neighbouring nations in the region complicate establishing an international gas pipeline network to cover the region.

The planned economic growth for the region even considering energy intensity conservation will require additional energy sources to be consumed. The path forward that economize the use of the petroleum resources will need to continue switching to natural gas and possibly renewable energy sources. In average the MENA region needs an economic growth of 5% annually considering population growth trend.

Under the above considerations it is essentially important to make certain set of assumptions that lead the research in this paper. Each assumption will take a hypothetical supposition that respond to different behaviour. The assumption here is as follows:

1. Assumption One: MENA is a self-contained Gas regional area
2. Assumption Two: MENA is not a self-contained Gas regional area

Under both assumptions we will be testing the behaviour of the region's members towards their balance of gas requirements in future. The aim here is to investigate if LNG could be a tool that assist balancing the region's gas markets.

Review of world LNG markets

LNG is mainly a logistics solution to balance demand-supply of the natural gas. It was first introduced to manage gas stock when the first LNG production and regasification solution started in the United States in 1941 in Cleveland, Ohio. The facility which was operated then is what is commonly called a peak shaving plant. There are now over one hundred such facilities in the U.S., located primarily near centres of high demand for natural gas, which liquefy gas during periods of low demand, and store it in an adjacent tank.

When demand peaks, LNG is withdrawn from the tank, re-gasified, and put back into the pipeline, thereby enhancing the pipeline system's ability to meet such periods of high demand.

Thereafter LNG has gained a new logistics function in 1959 when the Methane Pioneer carried LNG from Lake Charles, Louisiana, to Canvey Island in England, demonstrating for the first time that LNG could be safely transported across the ocean. The world's first commercial LNG production and export facility was constructed in Algeria, where exports began in 1964. Exports from the Kenai Peninsula, Alaska, to Japan began in 1969, heralding the beginning of a successful trade relationship that helped grow the Asian natural gas market into the largest demand centre in the world. Today Asia, led by the Japanese market, is the most frequent destination for international LNG shipments, and demand is expected to continue to grow in the years ahead. The United States began importing LNG in the 1970s when four LNG terminals were constructed in Louisiana and along the East Coast.

LNG differences to pipeline gas

The main differences between the LNG and the pipeline gas arises from three main factors. Basically, the LNG is assumed to have a higher cost than the pipeline gas as there are three values are added to its cost before consumption which are: cost of liquefaction, cost of transportation and cost of regasification. In order to compete in the marketplace LNG price theoretically should have a premium over the price of pipeline gas.

So far, pipeline flows between countries or continents have largely dominated the international gas trade.

It suffices to recall that LNG only accounts for 22% of international trade (only 5.6% of world natural gas demand). However, the rebalancing of natural gas markets, via gas pipelines, is often faced with technical, economic, even political limitations (International Gas Union, 2012):

Global LNG price trends

The policy of Japan to secure 90% of its annual LNG demand through long term contract pattern have for the last few decades stabilised the LNG prices. As the long-term contracts were signed during a period of limited supply terms have favoured the sellers and priced at substantial premium to the current spot market.

Most of the price are estimated in the range of 14.5% of the 3-month rolling average of the dated Brent crude oil price. This is known as legacy of oil price indexation that helped and still helping the contracted LNG price to stay above spot market levels.

Most of the oil-indexed arrangements will be expiring over the next 10 - 20 years which gives the buyers to power to decrease the price or disconnect it from oil price. LNG producers will be facing competition from number of North American producers who will tend to link their pricing strategy to gas-index liquefaction projects that takes Henry Hub gas price as a benchmark rather than oil related price.

More flexible terms of LNG pricing for new contracting rounds are expected to attract many buyers who wish to switch from other heavy carbonized fuels such as coal or oil. In the MENA region as we will discuss later some counties such as Morocco rely heavily on coal to generate electricity as a result of coal price attractiveness.

Regionalisation vs globalization of natural gas markets

The gas pipeline network trading scheme has contributed to

a large extent to create separate regional markets for gas. Each market has its distinctive market mechanism with respect to supply, demand and market clearance. Different pricing mechanism have established across regional markets that take into consideration the specific conditions of the energy markets and available energy alternatives to such market. Gas-to-gas, gas-to-oil or gas-to-coal are widespread methods to discover the gas price in a specific market. This was supported by lengthy supply contracts that extends up to 20 years for specific regions.

Liberalization of gas markets which have originally took place in the US and then extended to Europe could be considered as the game changer that gradually linked the gas markets across and formed a growing global gas market. The increasing supply of natural gas across the globe and the rising availability of spot gas especially on the LNG sector is fighting the market to a global trading scheme which will increasingly encircle the classical Long-term method.

The nature of energy markets in MENA

MENA countries are heavily dependent on fossil fuels i.e. natural gas, followed by oil and then coal in their energy mix. Renewables account for only 3 percent in 2015.

Oil was the main energy source in the MENA region for a long time but its share in the energy mix declined substantially below half. Natural gas has gained in importance across the region, surpassing oil as the primary source of energy in most countries. Natural gas accounts for the largest share of in Bahrain, Qatar, Oman, UAE, Algeria, Egypt and Iran, and is particularly relevant for power generation. This upward trend is more likely to continue in the future, thanks to locally available sources and the abundant world supply of shale gas and LNG (MENARA Working Papers, 2018).

Apart from Iran, nuclear energy is non-existent in the energy mix in the region, but the political decision to invest in nuclear energy remains an option for the future. The UAE and Turkey are advancing their nuclear programmes. Saudi Arabia, Egypt and Jordan also have plans to introduce nuclear power into their energy mix, while others (i.e., Algeria, Morocco and Tunisia) are in a more exploratory phase.

Despite their potential, the contribution of renewables to total primary energy demand is still minor, yet their role in the power sector is increasing. Renewables have been developed mostly in energy importing countries.

The intra-trade gas markets in MENA

Even though local requirements for natural gas are growing fast in many MENA region, major trunklines linking production areas with expanding markets are expected to be hindered by long-distances and geological complex and challenging political environment.

While the MENA area is considered as a main source of gas to the global markets the gas intra-trade between its countries is very thin. Gas trade by pipeline in 2016 between the members only reached 32.3 billion cubic meters. Half of the volume is traded between Qatar and UAE through the Delphine project.

With regard to the LNG trade Qatar in 2016 has exported 20 billion cubic meters to Middle East destinations mostly to UAE of 17.9 bcm.

The weak gas intra-trade between the MENA countries could be largely attributed to two factors. Firstly, lack of investment in the energy diversification infrastructure as the region is heavily reliant on the abundant oil resources. The other factor is related to the pricing mechanism that does not reflect the differential valuation of the gas against the other energy resources in the region. The advantages of the gas pricing in other regions such as Europe or in Asia are attracting investment in the gas sector away from the region.

Attempts to establish a central pricing gas hub for MENA have continuously interrupted by geopolitics uncertainties. Under such circumstances it is assumed that financing investment in the gas sector to enable the expansion of intra-trade (e.g. connecting pipelines, re-gasification facilities) will be stumbled.

The gas markets in MENA

Compared with global energy demand growth, the MENA region as a whole has doubled its share in world primary energy demand, from 4 per cent (370 MTOE) in 1990 to 8 per cent (1,084 MTOE) in 2015. By subregion, most of the growth has been observed in the Gulf Cooperation Council (GCC) countries as well as in Iran. For instance, Qatar and Oman witnessed the fastest growth in energy demand, with annual average rates of 8.1 per cent and 7.4 per cent respectively during the 1990–2015 period. In 2015, two countries, Saudi Arabia and Iran, accounted for 42 per cent of total primary energy demand in the region, followed by Egypt (7 per cent) and Algeria (6 per cent), with the rest accounting for the remaining 23 per cent.

Unconventional fossil fuel sources are increasingly playing an important role in several areas of the world. US shale gas production, for example, accounted for 5 per cent of total US gas production in 2004, 10 per cent in 2007 and 60 per cent in 2016. This development has turned the USA from a gas importer in 2007 to a gas exporter in 2016. The US shale revolution, combined with the rapid expansion of LNG capacity worldwide, has already started to reshape the regional and global natural gas market. These developments

have put pressure on the price of natural gas in all major gas markets. The shale gas revolution is not only a challenge to the MENA region in gas export markets but will also be a threat to the expansion of the chemical and petrochemical industry in the region, which is export oriented.

The rise of shale gas production in the USA has shifted the market outlook from scarcity to abundance and driven the USA into the LNG export business. The USA is now projected to become one of the top three LNG exporters in the world in the next few years. LNG is arguably the fastest-growing segment in the global energy business. By 2040, more than half of the world's gas trade will be via LNG rather than pipeline, according to the International Energy Agency (IEA). The volume and diversity of LNG trade flows have increased rapidly with the appearance of new exporting and importing countries. The number of LNG importing countries (Figure 3) has grown from one in 1964 to fifteen in 2005 and thirty-nine in 2017. During this period, more and more countries in the region have become LNG importers. Other countries, such as Morocco, may also join this group in the future.

The number of LNG exporting countries has also risen dramatically, from one in 1964 to more than twenty in 2017. Booming gas production and high gas prices have motivated many countries to expand their LNG export capacities or to become gas exporters by building LNG plants. In the MENA region, Qatar (the largest LNG exporter in the world), Algeria, Oman, the United Arab Emirates (UAE) and Egypt are currently among the main LNG exporting countries. An emerging problem, however, is that the LNG export rush has created excess supply, which may be extended as far as 2025.

The electricity markets in MENA

The rapid increase in energy demand, for electricity in particular, is arguably the most notable trend in the region. Whereas global electricity demand has been increasing by around 2.9 per cent on average annually, the increase was much larger in the MENA countries, at 6 per cent annually during the 1990–2015 period (Figure 6). In 2015, Saudi Arabia accounted for the largest share of electricity consumption, with 21.1 per cent (313 terawatt-hour, TWh) of total electricity consumption in the MENA region, followed by Iran with 16 per cent (236 TWh), Turkey with 14.6 per cent (215 TWh), Egypt with 11 per cent (160 TWh) and the UAE with 8.5 per cent (118 TWh).

Significant compound annual growth rates (CAGR) in electricity demand were seen in Oman, Qatar and UAE, with 8.4 per cent, 9 per cent and 8.5 per cent respectively during the 1990–2015 period. Most of the other countries had rates above 5 per cent.

Sources of electricity generation development in MENA

The MENA region is heavily dependent on fossil fuel to generate electricity. According to IEA Energy Balancing Database most countries recorded using oil and gas to meet their needs for generating electricity during the period 1990 - 2016. Some exceptions who used coal heavily to their energy mix are Morocco and Israel.

Gas percentage of generation in MENA

The switching to gas has made a significant advance in MENA especially during the last decade. The widening spread between liquids and gaseous hydrocarbons stimulated MENA countries to raise the share of gas in energy mix and in particular for generating electricity. The figure below shows the advance of gas's percentage share in electricity generation between 1990 and 2016 by country.

Balancing Gas markets in MENA and the possible Role of LNG to realize it

In order to explore the role of the LNG to stabilize the gas markets in MENA and whether this will be achieved through intra or inter trade the paper will follow the methodology captured in the figure below.

The first step is to forecast gas demand till 2040 by country through the growth in demand for electricity.

We will assume that new demand for will come solely from the electricity sector in the MENA country.

Secondly, through the balancing of production to consumption forecast the surplus/deficit status for each country will be derived. At the last stage we will be estimating how the balancing of the demand/supply would likely to be achieved either by a pipeline or LNG using some indications of cost, risks and likely projects.

Forecasting Gas demand in the MENA

As indicated above and for the purpose of this research we will be assuming that the new demand for gas will come solely from the electricity generation needs. This is supported by two main reasons, first is that the use of natural gas in industry has reached a plateau in MENA especially in the petrochemicals sector and we are seeing lower new projects in this sector in future supported by gas as a feedstock. The other reason is that the rapidly growing demand for electricity in most of the MENA region is likely to eat up all the potential gas resources in future.

The study uses a simple multivariate regression that considers gas consumption as the dependant variable while electricity demand and GDP as the independent variables. The data is

derived from the IEA Database for each country. The results show that all regressions are statistically significant with justifying P value, except for Iran and Libya which both have substantial discontinuity in their time series because of political disturbances which affected their energy supply patterns.

Scenario one: Estimation of gas demand in MENA with no renewable energy contribution to electricity generation

The MENA›s forecasted demand by country for gas arises from electricity demand till 2040 is shown in the table (2) below. The table reflects a base scenario which assumes that there is no introduction of solar based energy to electricity generation, which we look to in the second scenario.

When comparing for the first scenario the forecasted demand against forecasted production of gas in MENA we could arrive to the estimated surplus/deficit balance for each country. The data for the forecasted production were derived from GECF 2018 Annual Report (Gas Exporting Countries Forum (GECF), 2018).

From the table above eight countries are within the potential of realizing deficit in gas supply in the period up to 2040. These are Egypt, Kuwait, Morocco, Jordan, Saudi Arabia, Israel, Tunisia and UAE. All others should be either self-sufficient or an exporter of the gas. The deficits vary in size and in timing.

Countries such as Kuwait, Jordan, Morocco, Israel and UAE will have an imminent deficit position however the growing of such deficit will depend on how the electricity demand is forecasted to grow in the period.

Countries with much stronger GDP and limited gas reserves base are forecasted to have a bigger deficit towards the end of the period.

Egypt and Saudi Arabia will face the deficit situation towards the end of the period. Contrary to the scenario where solar energy is introduced as shown in the next scenario, Egypt will have a substantial deficit starting from 2035 and Saudi will start from 2032.

Scenario Two: Estimation of gas demand in MENA with 0.5% annual renewable energy (Solar) contribution to electricity generation

As there are no published official policy regarding the switch to renewable energy in MENA countries the research assumes that the countries would follow the global trend in switching to renewable sources of energy. This would be built in a modified scenario to the table above which adds a 0.5% introduction of solar energy to the electricity generation energy mix in annual basis. We assume that is the most possible scenario considering the speed rate of global switching to such sources.

Table (4) below illustrates the estimated demand for natural gas after deducting 0.5% annually to solar energy. The scenario considers that each country will maintain its natural gas share in 2016 of energy used in generating electricity.

Table (7) above shows seven countries are within the potential of realizing deficit in gas supply in the period up to 2040. These are Kuwait, Morocco, Jordan, Saudi Arabia, Israel, Tunisia and UAE. All others should be either self-sufficient or an exporter of the gas. The deficits vary in size and in timing. Countries such as Kuwait, Jordan, Morocco, Israel and UAE will have an imminent deficit position however the growing of such deficit will depend on how the electricity demand is forecasted to grow in the period.

Countries with much stronger GDP and limited gas reserves base are forecasted to have a bigger deficit towards the end of the period.

Towards the end of the period (year 2037) Saudi Arabia is estimated to realize sizable deficit in gas supply. Here it is important to mention that this situation will occur as a result of the estimated high GDP growth and high electricity demand as a result.

While it needs further investigation to explore how these countries are likely planning to meet their growing requirements of the gas it could be suggested that LNG will have a major role in balancing their needs as a result of two factors;

- The estimated high cost of building a Pipeline network that could serve as a connecting tool between gas producers and consumers in the region
- The expected continuation of geopolitics tension in the Arab Gulf region in particular that delays any consideration of pipeline trade-based method

The MENA region emerged as an LNG importer in 2009 when the Mina Al-Ahmadi Gas-Port came online in Kuwait. The UAE followed in 2010, and several other countries are in varying stages of development with their proposed terminals. The region's interest in LNG imports has been sparked by three trends:

rapid growth in demand (primarily for power), insufficient domestic production, and the failure of regional pipelines to provide sufficient volumes.

The MENA region has 6.8 mmtpa of existing regasification capacity and an additional 12.2 mmtpa of proposed capacity. Several projects will move forward as countries seek to push out fuel oil in power generation. Regional economies have experienced rapid growth in the last decade, with GDP growth averaging 5 - 6% per year. The region is home to

nearly 400 million people and has an aggregate GDP of $2.4 trillion, equivalent to that of France. Regional gas demand stood at 44 bcf/d in 2010, slightly more than that of Russia. Unlike developed economies, however, gas demand is growing at a brisk 6 - 7% per year.

How the region will manage this growth is an open question.

MENA nations are looking increasingly at importing LNG to address one or more of the following concerns:

I. Rapid Growth in Demand. Power demand is the key driver behind gas demand. Growing populations and expectations of heightened living standards are driving growth in power. Gas is being used to push out more expensive oil-fired power and also to satisfy incremental increases in power output. Demand growth is also coming from gas-intensive industries such as petrochemicals, refining, and aluminum production.

II. Insufficient Domestic Production. Associated gas production in Gulf countries is capped by OPEC quotas; non-associated gas in these countries is difficult and expensive to develop; other countries (Jordan, Lebanon, Morocco) do not have significant domestic reserves.

III. Political Issues Harm Regional Pipeline Developments. Several regional pipeline initiatives have moved forward, including the Arab Gas Pipeline and the Dolphin Pipeline. However, countries have consistently failed to develop a regional pipeline network, which is especially true in the Gulf. Egypt,s revolution has led to several cut-offs in gas supply to Israel, Jordan, Syria, and Lebanon, forcing some of these countries to look to LNG and other alternatives to ensure energy security.

Conclusion and recommendations

The study finds out that several MENA countries would fell into deficit regarding their gas supply in

the period 20192040-. This comes as a result of rapidly rising energy consumption especially electricity

generation requirements. On one hand, the imminent short fallers could greatly benefit from the current

over-supply situation in the global LNG market to secure their requirements. The global oversupply of

LNG and the entailing weaker price in the medium term, would encourage MENA countries even lowincome countries to start or expedite their LNG receiving plans. Country such as Morocco or Jordan

theoretically would gain from the expected low LNG price environment, if they to commit long term gas

supply arrangements.

On the other hand, supplier of natural gas would have the opportunity to gain markets if plans are set to

meet the underlined demand of MENA. Potential higher cost suppliers in North America are pushing with

policies to gain global markets including those emerging in the MENA area.

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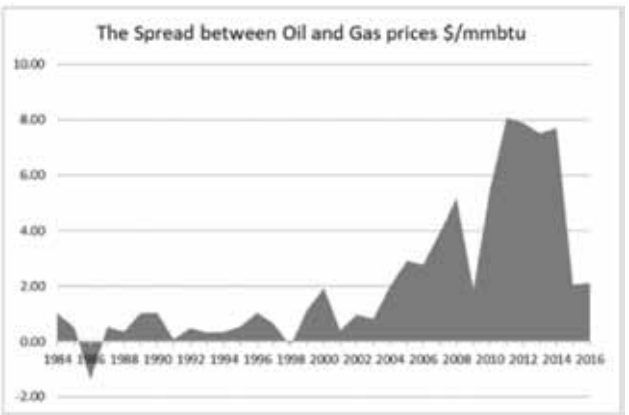


Figure 1—Spread between Oil and Gas price $/MMBTU
Source: Calculated from BP Energy Annual Statistical Report 2017

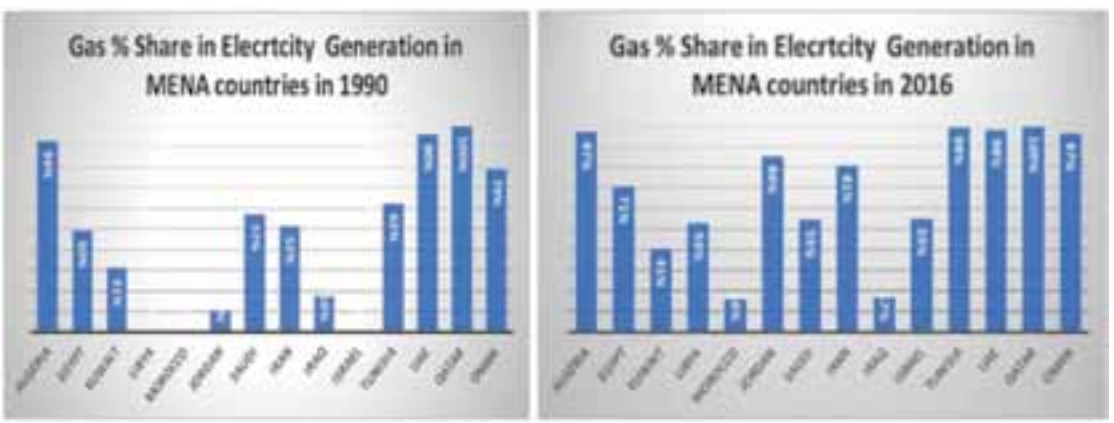


Figure 2—Gas Share in Electricity Generation in MENA
Source: own calculation based on IEA Energy Balance Database

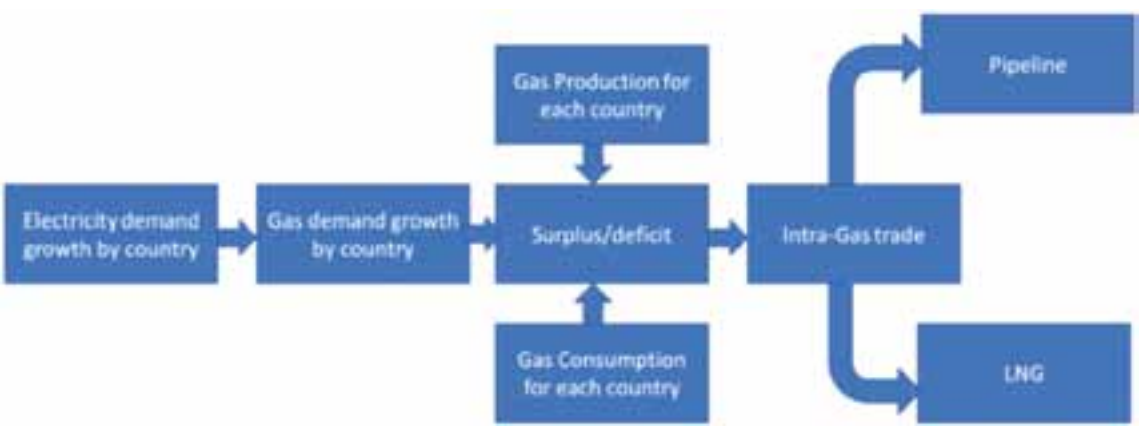


Figure 3—Model for estimating Gas trade in MENA

Figure 4—Multivariate regression model to estimate Gas demand in MENA

Table 1—Pipeline natural gas intra-trade in MENA (MTOE)

	To			
	Turkey	Oman	UAE	Tunisia + Morocco
From				
Iran	7.7			
Qatar		2.1	17.9	
Algeria				4.6

Source: BP Annual Energy Statistical, 2017

Table 2—Estimation of gas demand by country MTOE as a result of regression run

	Algeria	Egypt	Kuwait	Libya	Morocco	Jordan	Saudi	Iran	Iraq	Israel	Tunisia	UAE	Qatar	Oman
2018	12.82	35.58	4.98	4.08	7.88	5.06	82.43	41.98	7.58	19.57	4.06	29.70	8.86	6.98
2019	13.77	36.96	5.37	4.37	8.62	5.21	88.21	43.39	8.25	20.16	4.06	32.19	9.64	7.70
2020	14.31	38.41	5.90	4.46	9.15	5.39	89.22	45.51	8.51	20.75	4.21	33.35	10.09	7.97
2021	14.79	39.93	5.67	4.55	9.73	5.60	90.76	46.23	8.79	21.68	4.39	34.77	10.30	8.15
2022	15.16	41.53	5.88	4.67	10.35	5.83	93.03	47.51	9.12	22.60	4.62	36.32	10.60	8.40
2023	15.64	43.21	6.13	4.80	11.02	6.08	95.78	48.88	9.51	23.63	4.87	37.94	11.07	8.71
2024	16.35	44.98	6.38	4.97	11.73	6.35	98.84	50.26	9.97	24.71	5.15	39.71	11.65	9.06
2025	16.97	46.83	6.70	5.07	12.29	6.66	102.74	52.10	10.34	25.84	5.49	41.84	12.14	9.48
2026	17.62	48.77	7.04	5.16	12.87	7.00	106.84	54.02	10.74	27.04	5.72	44.09	12.67	9.98
2027	18.39	50.81	7.41	5.36	13.49	7.35	111.14	56.03	11.15	28.31	6.03	46.47	13.33	10.41
2028	19.00	52.96	7.80	5.37	14.13	7.72	115.66	58.14	11.59	29.64	6.36	48.99	13.82	10.89
2029	19.75	55.21	8.21	5.48	14.81	8.11	120.40	60.36	12.04	31.06	6.71	51.65	14.48	11.41
2030	20.53	57.57	8.65	5.60	15.52	8.53	125.38	62.69	12.52	32.56	7.08	54.47	15.08	11.96
2031	21.35	60.06	9.14	5.72	16.27	8.97	130.60	65.13	13.02	34.14	7.47	57.44	15.76	12.52
2032	22.22	62.66	9.63	5.85	17.05	9.44	136.09	67.70	13.55	35.81	7.88	60.58	16.47	13.12
2033	23.12	65.39	10.20	5.98	17.87	9.93	141.86	70.39	14.10	37.57	8.32	63.90	17.22	13.75
2034	24.08	68.27	10.78	6.12	18.74	10.46	147.91	73.22	14.68	39.43	8.78	67.42	18.01	14.41
2035	25.07	71.28	11.41	6.27	19.64	11.02	154.26	76.19	15.30	41.41	9.26	71.13	18.83	15.10
2036	26.12	74.45	12.08	6.43	20.60	11.61	160.93	79.31	15.96	43.50	9.79	75.05	19.70	15.83
2037	27.22	77.77	12.80	6.59	21.60	12.24	167.94	82.58	16.61	45.71	10.32	79.20	20.61	16.59
2038	28.38	81.27	13.57	6.76	22.65	12.90	175.30	86.02	17.32	48.04	10.89	83.58	21.57	17.39
2039	29.60	84.93	14.39	6.94	23.75	13.60	183.02	89.63	18.06	50.50	11.50	88.21	22.57	18.24
2040	30.87	88.78	15.27	7.13	24.91	14.35	191.13	93.43	18.84	53.10	12.14	93.11	23.63	19.12

Table 3—Calculation of deficit in gas supply based on Scenario One «no solar» MTOE

	Algeria	Egypt	Kuwait	Libya	Morocco	Jordan	Saudi	Iran	Iraq	Israel	Tunisia	UAE	Qatar	Oman
2018	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020	-	0.00	2.83	0.00	7.30	0.81	0.00	0.00	0.00	9.71	0.02	0.55	0.00	0.00
2021	-	0.00	2.64	0.00	7.76	0.84	0.00	0.00	0.00	10.12	0.02	0.57	0.00	0.00
2022	-	0.00	3.06	0.00	8.27	0.88	0.00	0.00	0.00	10.58	0.03	0.60	0.00	0.00
2023	-	0.00	3.19	0.00	8.80	0.91	0.00	0.00	0.00	11.06	0.03	0.62	0.00	0.00
2024	-	0.00	3.35	0.00	9.22	0.96	0.00	0.00	0.00	11.57	0.03	0.66	0.00	0.00
2025	-	0.00	3.52	0.00	9.65	1.01	0.00	0.00	0.00	12.11	0.03	0.69	0.00	0.00
2026	-	0.00	3.70	0.00	10.12	1.06	0.00	0.00	0.00	12.67	0.03	0.73	0.00	0.00
2027	-	0.00	3.90	0.00	10.60	1.11	0.00	0.00	0.00	13.27	0.03	0.77	0.00	0.00
2028	-	0.00	4.11	0.00	11.11	1.17	0.00	0.00	0.00	13.91	0.04	0.81	0.00	0.00
2029	-	0.00	4.33	0.00	11.64	1.23	0.00	0.00	0.00	14.58	0.04	0.85	0.00	0.00
2030	-	0.00	4.57	0.00	12.20	1.29	0.00	0.00	0.00	15.28	0.04	0.90	0.00	0.00
2031	-	0.00	4.83	0.00	12.79	1.36	0.00	0.00	0.00	16.03	0.04	0.95	0.00	0.00
2032	-	0.00	5.10	0.00	13.40	1.43	42.56	0.00	0.00	16.82	0.04	1.00	0.00	0.00
2033	-	0.00	5.39	0.00	14.05	1.51	44.17	0.00	0.00	17.66	0.05	1.06	0.00	0.00
2034	-	0.00	5.71	0.00	14.73	1.59	46.28	0.00	0.00	18.54	0.05	1.12	0.00	0.00
2035	-	21.54	6.04	0.00	15.45	1.67	48.28	0.00	0.00	19.48	0.05	1.18	0.00	0.00
2036	-	22.50	6.40	0.00	16.20	1.76	50.38	0.00	0.00	20.46	0.05	1.24	0.00	0.00
2037	-	23.52	6.78	0.00	16.99	1.86	52.59	0.00	0.00	21.51	0.06	1.31	0.00	0.00
2038	-	24.58	7.19	0.00	17.81	1.96	54.91	0.00	0.00	22.61	0.06	1.38	0.00	0.00
2039	-	25.80	7.63	0.00	18.68	2.07	57.34	0.00	0.00	23.78	0.06	1.46	0.00	0.00
2040	-	26.98	8.10	0.00	19.59	2.18	59.89	0.00	0.00	25.01	0.07	1.54	0.00	0.00

Table 4—Estimation of gas demand by country MTOE as a result deducting 0.5% annually for solar switching

	Algeria	Egypt	Kuwait	Libya	Morocco	Jordan	Saudi	Iran	Iraq	Israel	Tunisia	UAE	Qatar	Oman
2018	33.77	38.96	5.37	4.37	8.62	5.21	86.21	45.89	8.25	20.26	4.06	32.15	9.64	7.70
2019	34.31	39.41	5.52	4.46	9.15	5.39	89.22	46.51	8.51	20.75	4.21	33.35	10.09	7.97
2020	34.49	39.19	5.82	3.76	9.42	6.77	93.71	37.16	9.62	11.92	4.35	34.05	10.25	7.83
2021	34.78	39.17	5.91	3.82	9.56	6.94	94.47	38.00	9.73	12.36	4.55	35.39	10.50	8.04
2022	35.17	39.19	6.02	3.49	9.71	7.13	95.04	38.89	9.81	12.86	4.77	36.79	10.91	8.25
2023	35.75	39.27	6.13	3.51	9.87	7.33	97.61	39.80	9.98	13.37	5.02	38.30	11.40	8.53
2024	36.29	39.39	6.23	3.55	10.00	7.50	99.17	41.04	10.03	13.91	5.26	40.15	11.84	8.93
2025	36.82	39.56	6.42	3.60	10.12	7.83	72.54	42.33	10.12	14.49	5.52	42.10	12.29	9.30
2026	37.38	39.78	6.57	3.65	10.25	8.07	73.07	43.68	10.23	15.05	5.79	44.14	12.77	9.66
2027	37.96	39.06	6.74	3.71	10.39	8.34	77.72	45.07	10.34	15.72	6.08	46.30	13.26	10.10
2028	38.57	37.40	6.92	3.78	10.54	8.63	80.46	46.56	10.45	16.38	6.38	48.56	13.78	10.52
2029	39.20	38.80	7.11	3.82	10.69	8.93	83.38	48.10	10.57	17.08	6.69	50.93	14.33	10.96
2030	39.87	40.26	7.32	3.88	10.85	9.25	86.39	49.72	10.69	17.82	7.02	53.43	14.89	11.43
2031	40.56	41.78	7.54	3.95	11.01	9.59	89.56	51.40	10.82	18.59	7.37	56.05	15.48	11.92
2032	41.28	43.37	7.77	4.02	11.18	9.95	92.88	53.16	10.96	19.40	7.74	58.83	16.10	12.42
2033	42.04	45.04	8.02	4.09	11.36	10.33	96.29	55.00	11.10	20.26	8.13	61.74	16.75	12.94
2034	42.83	46.77	8.28	4.17	11.54	10.72	99.88	56.93	11.25	21.16	8.52	64.76	17.42	13.48
2035	43.66	48.58	8.55	4.25	11.74	11.14	103.64	58.94	11.40	22.10	8.93	67.96	18.13	14.05
2036	44.52	50.48	8.83	4.34	11.94	11.58	107.57	61.04	11.56	23.10	9.37	71.33	18.86	14.64
2037	45.42	52.46	9.12	4.43	12.15	12.05	111.66	63.23	11.73	24.14	9.82	74.86	19.63	15.25
2038	46.37	54.53	9.43	4.52	12.37	12.54	115.94	65.53	11.90	25.24	10.31	78.58	20.43	15.94
2039	47.35	56.68	9.87	4.62	12.60	13.06	120.41	67.92	12.09	26.40	10.87	82.48	21.26	16.62
2040	48.38	58.95	7.25	4.72	12.85	13.60	125.08	70.42	12.28	27.61	11.41	86.55	22.14	17.35

Table 5—Calculation of deficit in gas supply based on Scenario Two «after solar deduction» MTOE

	Algeria	Egypt	Kuwait	Libya	Morocco	Jordan	Saudi	Iran	Iraq	Israel	Tunisia	UAE	Qatar	Oman
2018	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020	-	0.00	2.85	0.00	7.31	0.83	0.00	0.00	0.00	9.77	0.04	0.72	0.00	0.00
2021	-	0.00	2.97	0.00	7.79	0.89	0.00	0.00	0.00	10.25	0.07	0.93	0.00	0.00
2022	-	0.00	3.11	0.00	8.31	0.95	0.00	0.00	0.00	10.78	0.10	1.16	0.00	0.00
2023	-	0.00	3.25	0.00	8.86	1.02	0.00	0.00	0.00	11.33	0.13	1.40	0.00	0.00
2024	-	0.00	3.43	0.00	9.29	1.10	0.00	0.00	0.00	11.93	0.16	1.69	0.00	0.00
2025	-	0.00	3.63	0.00	9.75	1.19	0.00	0.00	0.00	12.55	0.20	1.99	0.00	0.00
2026	-	0.00	3.83	0.00	10.23	1.28	0.00	0.00	0.00	13.22	0.24	2.33	0.00	0.00
2027	-	0.00	4.05	0.00	10.76	1.38	0.00	0.00	0.00	13.93	0.29	2.70	0.00	0.00
2028	-	0.00	4.29	0.00	11.27	1.48	0.00	0.00	0.00	14.68	0.34	3.10	0.00	0.00
2029	-	0.00	4.55	0.00	11.83	1.59	0.00	0.00	0.00	15.47	0.39	3.53	0.00	0.00
2030	-	0.00	4.82	0.00	12.42	1.71	0.00	0.00	0.00	16.32	0.45	4.01	0.00	0.00
2031	-	0.00	5.12	0.00	13.04	1.84	0.00	0.00	0.00	17.22	0.51	4.53	0.00	0.00
2032	-	0.00	5.43	0.00	13.70	1.98	0.00	0.00	0.00	18.17	0.58	5.09	0.00	0.00
2033	-	0.00	5.77	0.00	14.38	2.13	0.00	0.00	0.00	19.18	0.66	5.70	0.00	0.00
2034	-	0.00	6.13	0.00	15.10	2.29	0.00	0.00	0.00	20.26	0.74	6.37	0.00	0.00
2035	-	0.00	6.52	0.00	15.86	2.47	0.00	0.00	0.00	21.40	0.83	7.09	0.00	0.00
2036	-	0.00	6.94	0.00	16.66	2.65	0.00	0.00	0.00	22.61	0.93	7.87	0.00	0.00
2037	-	0.00	7.39	0.00	17.50	2.85	81.62	0.00	0.00	23.89	1.03	8.72	0.00	0.00
2038	-	0.00	7.88	0.00	18.38	3.06	87.08	0.00	0.00	25.26	1.15	9.63	0.00	0.00
2039	-	0.00	8.40	0.00	19.30	3.29	70.72	0.00	0.00	26.71	1.27	10.63	0.00	0.00
2040	-	0.00	8.96	0.00	20.28	3.54	74.57	0.00	0.00	28.25	1.41	11.70	0.00	0.00

Table 6—Possible Trade patterns for Gas in MENA

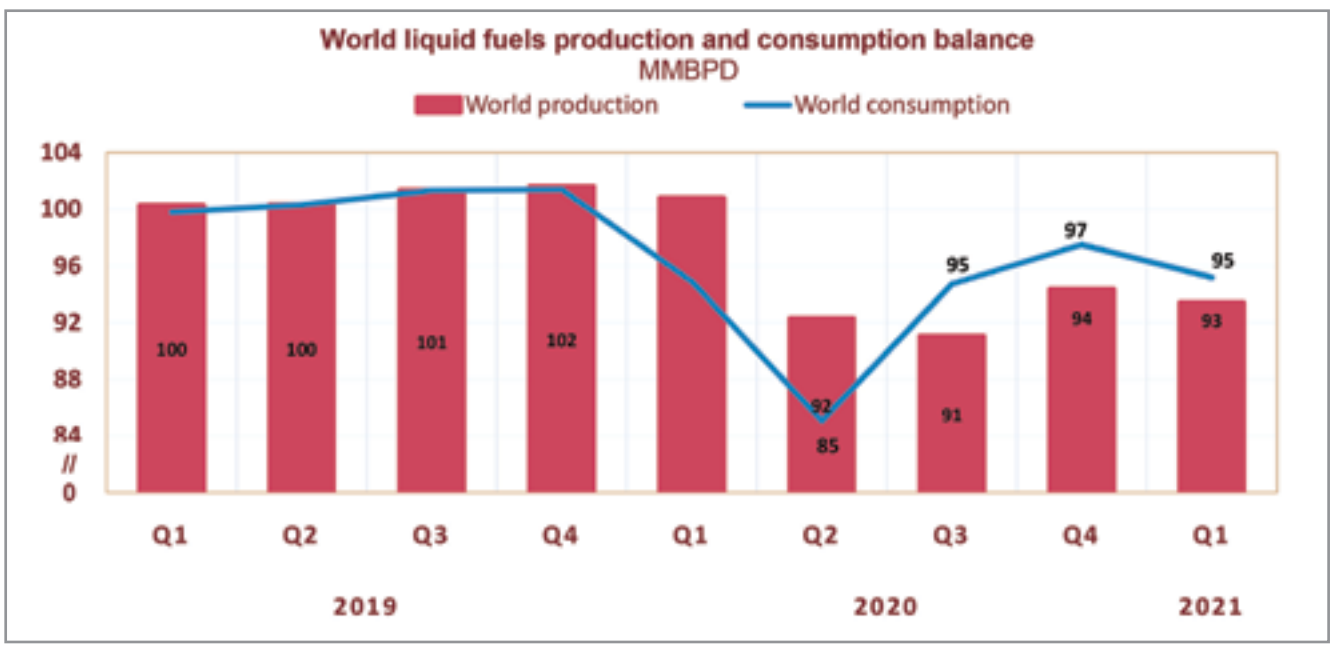
	Deficit size	Pipeline probability and sources			LNG probability and of MENA source	
		Probability	Sources	Hindrance	Probability	Source
Egypt	Big (only if solar energy is not introduced)	Possible	Libya	Libya's int. commitments	Possible	Algeria
Kuwait	Big	Possible	Qatar, Iran, Iraq	Geopolitics	Possible	Qatar
Morocco	Big	Possible	Algeria, Nigeria, Libya	Geopolitics and cost	Possible	Algeria, Libya
Jordan	Med.	Possible	Egypt, Qatar	Geopolitics and cost	Possible	Egypt, Algeria, Libya
Saudi	Big (end period)	Possible	Qatar	Geopolitics	Possible	Qatar, Oman
Israel	Big	Possible	Egypt	Geopolitics	Possible	Egypt
Tunisia	Small	Possible	Algeria, Libya	Not	No need	
UAE	Big	Possible	Qatar, Iraq, Iran	Geopolitics	Possible	Qatar

INDUSTRY AT A GLANCE

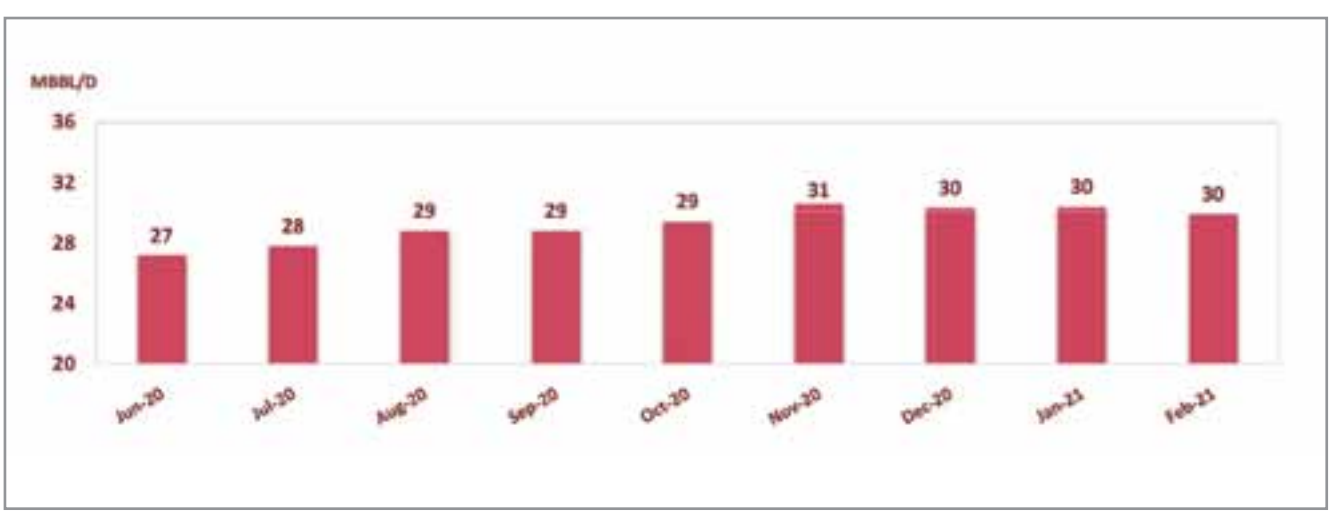
by: **Ali Ibrahim**

World liquid fuels production and consumption balance

million barrels per day



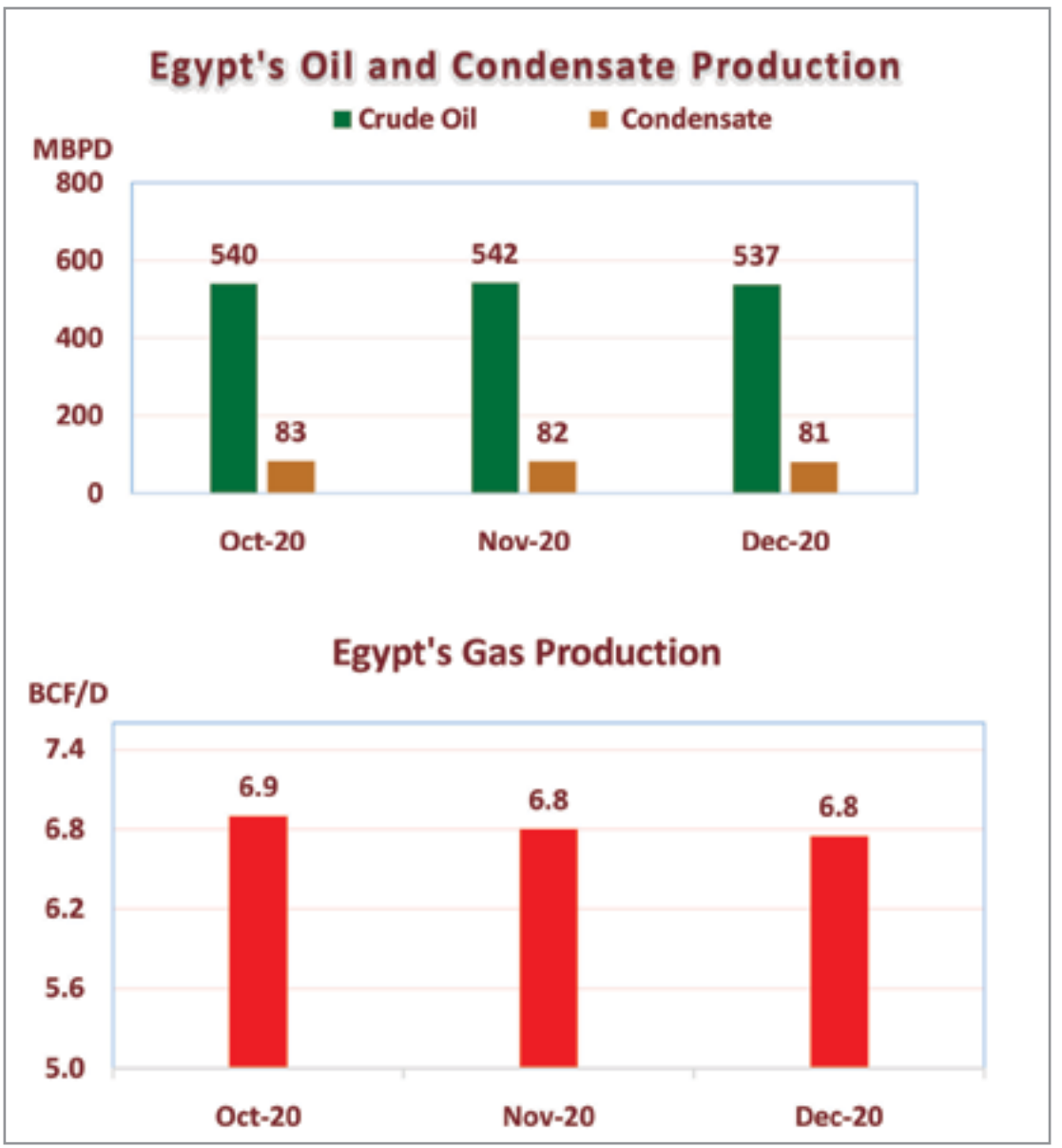
OPEC Crude Oil Production

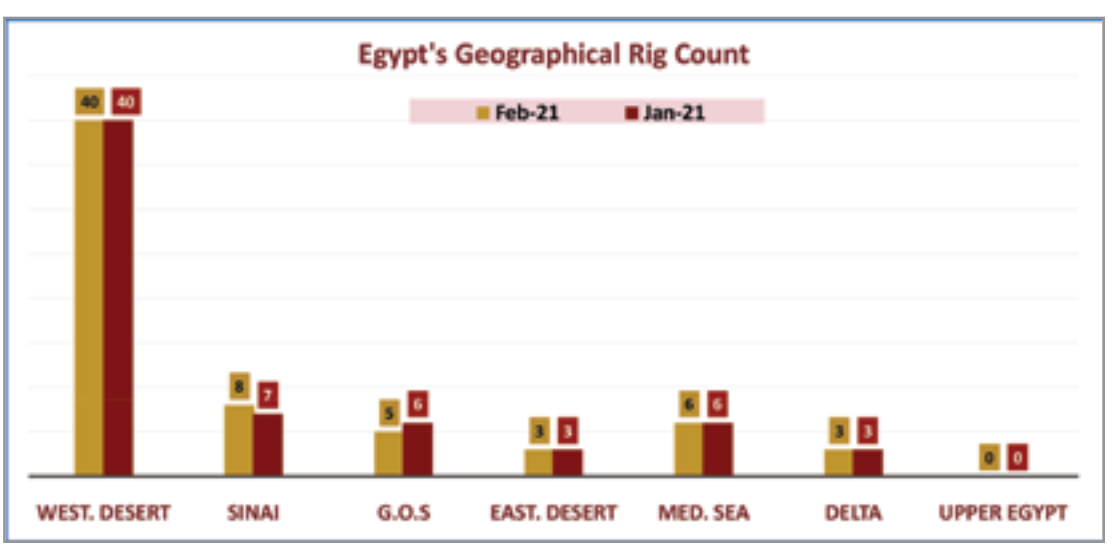


Crude Oil Prices

NYMEX Natural Gas Prices

USD/Million BTU


Egypt's Oil and Condensate Production
Crude Oil
Condensate
MBPD
800
600
400
200
0
540
542
537
83
82
81
Oct-20
Nov-20
Dec-20
Egypt's Gas Production
BCF/D
7.4
6.8
6.2
5.6
5.0
6.9
6.8
6.8
Oct-20
Nov-20
Dec-20


Egypt's Geographical Rig Count
Feb-21
Jan-21
40
40
8
7
5
6
3
3
6
6
3
3
0
0
WEST. DESERT
SINAI
G.O.S
EAST. DESERT
MED. SEA
DELTA
UPPER EGYPT

غاز مصر تشارك فى مبادرة إحلال السيارات

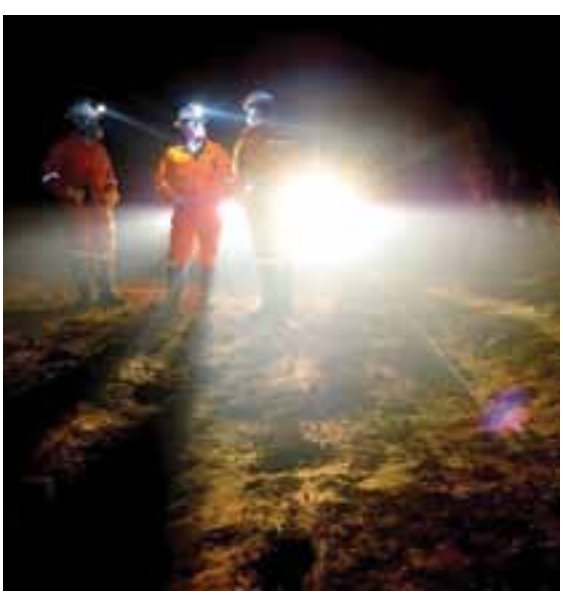
ستشارك شركة غاز مصر فى المبادرة الرئاسية لإحلال السيارات القديمة وتحويلها للعمل بالغاز الطبيعي، سواء بشكل مباشر أو غير مباشر. وتعتزم الشركة المشاركة فى مشروع توصيل الغاز الطبيعى للسيارات، عبر المساهمة فى تنفيذ الأعمال المدنية والإنشائية لنحو ٦٠٠ محطة وقود. وأطلقت الحكومة المصرية مؤخرًا المرحلة الأولى من مبادرة إحلال السيارات التى مر على صنعها ٢٠ عامًا، وتحويلها للعمل بالغاز الطبيعي، لتستهدف خلال عام ٢٠٢١، استبدال ٧٠ ألف سيارة قديمة، وقرابة ١٨٠ ألف وحدة فى عامى ٢٠٢٢ و٢٠٢٣. وشاركت الشركة العام الماضي فى مشروع التوسع بتوصيل الغاز الطبيعى للسيارات، عبر تنفيذ الأعمال المدنية، والإنشائية لحوالى ١٠١ محطة بنزين.

توربودن وسيمنس للطاقة يطوران أول محطة لضواغط الغاز فى مصر

ستقوم شركة توربودن الإيطالية، احدى شركات مجموعة ميتسوبيشي للصناعات الثقيلة، بتوريد أكبر نظام من نوعه لدورة رانكين العضوية، والذي سيقترن بأنظمة ضواغط الهواء التي تعمل بمحركات كهربائية من سيمنس للطاقة، بهدف زيادة الكفاءة التشغيلية لمحطة ضغط الغاز التابعة للشركة المصرية للغازات الطبيعية في منطقة دهشور.وستصبح محطة ضغط الغازات التابعة للشركة المصرية للغازات الطبيعية، من المشروعات الرائدة في المنطقة خاصة بعد تنفيذ النظام الجديد لرفع كفاءة الطاقة بالمحطة. هذا وسيعتمد النظام على الحرارة الناتجة عن التوربينات الغازية الأربعة الحالية وكذلك الحرارة الناتجة من التوربينات الغازية الجديدة عالية الكفاءة من سيمنس للطاقة والتي تتمتع بانخفاض انبعاثاتها الكربونية. وبفضل عملية استعادة الحرارة من العوادم الغازية ونظم ضواغط الغازات عالية الكفاءة، سيتيح هذا الحل المتكامل توليد ١٩٢ جيجاوات/ساعة كل عام من الكهرباء دون الإعتماد على وقود. هذه الطاقة التي تغذي ضاغطي الهواء قدرة ١٠ ميجاوات واللذان يعملان بمحركات كهربائية، ستتيح للشركة توفير ٦٥ مليون متر مكعب من الغاز الطبيعي كل عام، وبالتالي تقليل الانبعاثات الكربونية بمقدار ١٢٠ مليون طن من غاز ثاني أكسيد الكربون سنويًا (وهو ما يعادل الغازات المنبعثة من مساحة من الغابات تعادل ست مرات أكبر من منطقة مانهاتن بنيويورك).

ألتوس توسع حضورها فى مصر بأربعة تراخيص جديدة للتنقيب عن الذهب

تعمل Altus Strategies على توسيع تواجدها في مصر بعد الحصول على أربع تراخيص جديدة للتنقيب عن الذهب في الصحراء الشرقية المصرية، والتي تضاف إلى سلسلة التصاريح التي حصلت عليها في يناير. حيث وافقت هيئة الموارد المعدنية المصرية (EMRA) على منح التصاريح لشركة Akh Gold التابعة للشركة. وقالت ألتوس إن التراخيص ، التي تتألف من تسعة مناطق امتياز ويبلغ مساحتها ١٥٦٥ كيلومترًا. يأتي قرار Altus بالتوسع بمصر في أعقاب استثمار استراتيجي من قبل شركة استثمار الذهب الخاصة المملوكة لمصر ، لامانتشا ، التي اشترت ٣٥٪ من الشركة في فبراير ٢٠٢٠. وقال الرئيس التنفيذي ستيفن بولتون: "هذا يعكس إيماننا بفرص الاستثمار الكبيرة الموجودة في البلاد ويتماشى مع استراتيجيتنا لمواصلة تنمية محفظتنا المتنوعة من المشاريع والعائدات".وعلى عكس قطاع الغاز الطبيعي في مصر، لا تزال الثروة المعدنية للبلاد غير مستكشفة وغير متطورة إلى حد كبير. لديها منجم ذهب تجاري واحد فقط ، منجم السكري التابع ل Centamin، الذي يساهم بما يصل إلى ٩٠٠ مليون دولار سنويًا في الناتج المحلي الإجمالي للبلاد. وتستهدف مصر ، التي تربط شمال شرق إفريقيا بالشرق الأوسط ، استثمارات جديدة بقيمة مليار دولار في قطاعي التعدين والطاقة بحلول ٢٠٣٠.



تكريم المجموعة الأولى من خريجى برنامج القادة لإدارة الأعمال فى صناعة الطاقة العالمية

شهد المهندس طارق الملا وزير البترول والثروة المعدنية لقاء تكريم المجموعة الأولى من خريجى برنامج القادة لإدارة الأعمال فى صناعة الطاقة العالمية بالتعاون مع شركة اينى الإيطالية، بحضور السيد اليساندرو بيوليتى مدير عام العمليات بشركة اينى للموارد الطبيعية والسيد تيزيانو كولومبو مدير عام جامعة شركة اينى عبر تقنية الفيديو كونفرانس وماركو روتوندى مدير عام شركة ايوك. ويعد هذا البرنامج أحد البرامج السبع ضمن مشروع تحديث وتطوير قطاع البترول المعنى بتنمية الموارد البشرية والذى يهدف إلى تأهيل الكوادر الشابة لتولى المناصب القيادية لاستدامة قطاع البترول في تحقيق نتائج متميزة خلال المستقبل ودعم الاقتصاد القومى.وأشاد الملا بجهود شركة إينى التى تُعد شريك استراتيجى لقطاع البترول لأكثر من ٦٠ عاماً، ودورها المهم في هذا البرنامج والتزامها بتدريب الكوادر في مناطق عملها سواء داخل أو خارج مصر وذلك رغم التحديات وظروف جائحة كورونا.ومن جانبه أشاد مدير عام العمليات شركة إينى بالتعاون مع وزارة البترول والمشاركة في هذا البرنامج بتقيدم التسهيلات لتثل مهارات الكوادر الشابة مما يسهم فى خدمة صناعة البترول والغاز العالمية التي تشهد تطورات باستمرار.ووجه مدير عام جامعة شركة إينى التهنئة لفريق البرنامج وتحقيق النجاح رغم جائحة كورونا والتغلب عليها من خلال المحاضرات الافتراضية للمتدربين ، مشيراً إلى أن القيادة من العناصر الهامة لإنجاح منظومة العمل البترولى.وفى نهاية اللقاء قام وزير البترول بتسليم الشهادات لفريق المجوعة الأولى من البرنامج الذين أشادوا بدعم الوزارة، وأوضحوا أن هذا البرنامج ساعدهم على اكتساب مهارات فنية وإدارية ستساعدهم فى حياتهم العملية خلال الفترة القادمة.

توقيع اتفاقية تعاون لبدء دراسات إنتاج "الهيدروجين الأخضر" لتوليد الطاقة

شهد الدكتور مصطفى مدبولي، رئيس مجلس الوزراء، مراسم توقيع اتفاقية تعاون بين وزارتي الكهرباء والطاقة المتجددة، والبترول والثروة المعدنية، والقوات البحرية من جانب، وشركة "ديمي" البلجيكية من جانب آخر؛ للبدء في الدراسات الخاصة لمشروع إنتاج "الهيدروجين الأخضر" وتصديره من مصر، وذلك بحضور الدكتور محمد شاكر، وزير الكهرباء والطاقة المتجددة، والمهندس طارق الملا، وزير البترول والثروة المعدنية، والفريق أحمد خالد، قائد القوات البحرية، ومن الجانب البلجيكي، فرانسوا دي إلزيوس، سفير بلجيكا لدى القاهرة.ووقع الاتفاقية كل من المهندس جابر الدسوقي، رئيس الشركة المصرية القابضة لكهرباء مصر، وآلان برنارد، رئيس مجلس إدارة شركة "ديمي".

وقال وزير الكهرباء والطاقة المتجددة، أن التوقيع علي هذه الاتفاقية يؤذن بالبدء في الدراسات لتنفيذ مشروع تجريبي لإنتاج "الهيدروجين الأخضر" في مصر كخطوة نحو التوسع في هذا المجال وصولاً الى إمكانية التصدير، وذلك اتصالاً بالتوجه العالمي للحد من انبعاثات الكربون وتخفيف آثار تغير المناخ، وتماشياً مع استراتيجية الاتحاد الأوروبي لخفض انبعاثات ثاني أكسيد الكربون المعروفة بـ "الاتفاق الأخضر" خلال الفترة الزمنية ٢٠٣٥-٢٠٥٠.كما أوضح الوزير الأهمية العالمية لـ "الهيدروجين الأخضر" كمصدر واعد للطاقة في المستقبل القريب.وصرح بأن هناك لجنة وزارية على المستوى الوطني لدراسة الهيدروجين كمصدر للطاقة في المستقبل القريب في مصر، والبحث في جميع البدائل الممكنة لتوليد واستخدام الهيدروجين، والاستفادة من التجارب الدولية في هذا المجال، منوها إلى أنه سيتم تحديث "استراتيجية الطاقة في مصر" لتشمل "الهيدروجين الأخضر" كمصدر للطاقة.

من جانبه، أشار رئيس مجلس إدارة شركة "ديمي" البلجيكية إلى أن المشروع يأتي في إطار تعهدات المملكة البلجيكية بتطبيق "الاتفاق الأخضر"، باعتبارها إحدى الدول الأعضاء بالاتحاد الأوروبي، ومن هذا المنطلق سعت الشركة إلى اختيار أفضل المواقع التي تصلح لإنشاء مراكز محورية لإنتاج "الهيدروجين الأخضر"، وبعد دراسة متخصصة قامت الشركة بإجرائها، وقع الاختيار على مصر لإقامة المشروع، نظراً لموقعها المتميز ولتمتعها بمصادر الطاقة المتجددة، لاسيما الطاقة الشمسية وطاقة الرياح، إلى جانب توافر البنية التحتية البرية والبحرية المؤهلة، والأيدي العاملة الماهرة، بدعم من رصيد العلاقات المتميزة التي تربط بين مصر وبلجيكا.

وزارة البترول تحذر العاملين بالقطاع من تداول بياناتهم الشخصية والوظيفية

تهيب وزارة البترول والثروة المعدنية بالسادة العاملين بقطاع البترول عدم الانسياق وراء احدى مجموعات (جروبات) التواصل الاجتماعي على موقع فيسبوك التي تتداول منشورات تطلب من السادة العاملين الادلاء ببيانات شخصية ووظيفية تخصهم في نموذج لجمع البيانات تجنبا لاستغلال هذه البيانات بشكل خاطيء و يعرض البيانات الخاصة للعاملين للتداول و الاستغلال من جهات غير معلومة. وتؤكد الوزارة ان هذه المنشورات مجهولة المصدر وليس للوزارة اي صلة بها، كما تؤكد عدم مسئوليتها عما ورد بها وتحذر من استخدام الشعار الخاص بالوزارة في أي منشورات غير صادرة عنها، وانها تحتفظ بحقها القانوني في ملاحقة مثل هذه المجموعات والصفحات مجهولة المصدر.

شل توقع اتفاقًا لبيع أصولها البرية فى مصر بـ ٩٢٦ مليون دولار

أعلنت شل مصر توقيعها اتفاقا لبيع أصولها البرية في الصحراء الغربية والتي تشمل أصول شل البرية في مصر "١٣ امتيازا بالإضافة لحصتها في شركة بدر الدين للبترول" إلى شركتي تشيرون بتروليوم وكيرن إنرجي بي إل سي بمقابل نحو ٩٢٦ مليون دولار. وقالت "شل" في بيان ان سداد قيمة الصفقة سيكون بقيمة ابتدائية ٦٤٦ مليون دولار، ودفعات قد تصل إلى ٢٨٠ مليون دولار بين ٢٠٢١ و٢٠٢٤ "بناء على سعر النفط ونتائج الاستكشافات المقبلة".وتابع البيان أن الصفقة تخضع للموافقات الحكومية، ومن المتوقع الانتهاء منها في النصف الثاني من العام الجاري.

الانتهاء من تجارب تشغيل حقل الغاز ريفين استعدادا لوضعه على الإنتاج

كشفت مصادر مسئولة بقطاع البترول عن الانتهاء من تجارب تشغيل حقل ريفين تمهيدا لبدء الإنتاج الفعلى، وطبقا للمصادر فإنه خلال فترة وجيزة سيتم وضعه على الإنتاج. هذا المشروع يأتي فى إطار المرحلة الثالثة من مشروع تنمية منطقة غرب دلتا النيل العميقة بالبحر المتوسط ومن المخطط الإنتاج منه بمعدل يبلغ حوالي ٨٥٠ مليون قدم مكعب غاز يومياً وحوالي ٢٣ ألف برميل متكثفات يومياً. ويهدف مشروع تنمية حقول شمال الإسكندرية وغرب دلتا النيل لتنمية الاحتياطيات المكتشفة بالمياه العميقة من الغاز الطبيعى والمتكثفات والتي تقدر بحوالي ٥ تريليون قدم مكعب من الغازات من خمسة حقول (تورس- ليبرا -جيزة-فيوم-ريفين) وتبلغ التكلفة الاستثمارية للمشروع حوالي ١٠,٥ مليار دولار. وقد افتتح الرئيس عبد الفتاح السيسى المشروع فى ١٠مايو ٢٠١٧ والذى كان قد بدأ الإنتاج التجريبى منه فى مارس٢٠١٧ من (حقلي تورس وليبرا) بإجمالي ٩ آبار بمعدل إنتاج أولي حوالي ٧٠٠ مليون قدم مكعب غاز يومياً وبتكلفة استثمارية حوالي ١,٨ مليار دولار وقبل الموعد المحدد بثمانية أشهر وبأقل من الميزانية المحددة، كما تم بدء الإنتاج من حقول جيزة وفيوم (مرحلة ثانية) في فبراير٢٠١٩ بمعدلات إنتاج أولية ٤٠٠ مليون قدم مكعب يومياً وصلت إلى حوالي ٦٠٠ مليون قدم مكعب/يوم.

خلال زيارة وزير البترول لرام الله.. توقيع مذكرة تفاهم جديدة بين مصر وفلسطين

أكّـد المهندس طارق الملّا وزير البـترول والثروة المعدنية المصـري ود. محمد مصـطفى مستشار الرئيس للشؤون الاقتصادية ورئيس مجلس إدارة صندوق الاسـتثمار الفلسطيني على أهمية تعزيز التعـاون المصـري الفلسـطيني القائـم في قطاع الطاقـة والـثروات والمصـادر الطبيعيـة خاصّـة الغاز الطبيعي.جاء ذلك خـلال اجتماع المهندس المـلا ود. مصطفـى وبحضـور المهندس ظافـر ملحم رئيس سلطة الطاقـة الفلسطينية في مقرّ الرئاسـة بمدينـة رام الله خلال الزيـارة الأولى لمعـالي المهندس المـلا إلى فلسطين بعـد اجتماع سيادته مـع فخامة الرئيس محمـود عبّاس الذي أشـاد بمواقف الرئيس السيسي لدعـم القضية الفلسطينيـة علي كافـة الاصعـدة والمجالات وان هذه الزيارة وتوقيـع مذكرة التفاهم خطوة مهمة للتعـاون في مجال الطاقة خاصـة الغاز الطبيعي. وناقش الجانبـان خلال الاجتماع سبـل النهوض بالتعاون القائم في هذا القطاع الحيوي، حيث أكّد المهندس الملّا خلال الاجتمـاع على موقف مصر الثابـت والداعم للحقـوق الوطنيـة الفلسطينية، بمـا فيهـا حقـه في استغـلال مـوارده الطبيعيـة وسيادته على هذه الموارد، وفي مقدمتها حقل غاز غزّة.وأكّـد الجانبـان على أهميـة تثبيت الموقفين المصـري والفلسطينـي الموحـد تجـاه ضـرورة التسريـع في تطويـر حقـل غـاز غـزة، مشددين علـى أهمية منتدى غاز شـرق المتوسط في تسهيل استغـلال الـدول الاعضـاء لمواردهـا الطبيعيـة

خاصـة الغاز، علمـاً أن دولة فلسطـين كانت أول دولة تصـادق على الميثاق بصفتهـا دولة مؤسسة في المنتدى الذي أصبـح منظمّةً إقليمية، وقد أكد الجانبان أن تطوير حقل غـاز غزة سيكون له أثر كبـير على قطاع الطاقـة في فلسطين وتحديداً في إيجـاد حلّ جذري لأزمة الطاقـة التي يعاني منها قطاع غـزة، وتزويد محطة جنـين لتوليد الطاقة بالغاز مما سيساهم في تعزيز الاستقلال الوطني الفلسطينـي والاعتمـاد علـى المـوارد الوطنية في قطـاع الطاقـة. واتفـق الجانبان في هـذا الإطار علـى تكثيـف التعـاون الثنائـي، ومع بقيـة الدول الأعضـاء في منتدى غاز شـرق المتوسط من أجل تسهيـل وتسريع عملية تطوير حقل غاز غزة الذي طـال انتظاره.كما وقع الجانبان مذكرة تفاهم ما بـين الأطراف الشريكة في حقل غاز غزة والمتمثلة حالياً بصندوق الاستثمار وشركة اتحاد المقاولين مـع الشركة المصرية القابضـة للغازات الطبيعية "ايجاس" للتعاون بمساعي تطوير حقل غاز غزة والبنيـة التحتيـة اللازمة، بمـا يوفّـر احتياجات فلسطين مـن الغـاز الطبيعي ويعـزز التعاون بين البلديـن الشقيقـين وإمكانيـة تصديـر جزء من الغاز لجمهورية مصر الشقيقة.

تراجع دعم المشـتقات البترولية فى مصـر بنحو ٤٥٪ خلال النصف الأول

هبـط دعم المشتقـات البترولية نحـو ٤٥ بالمئـة في النصف الأول من السنـة الماليـة الحاليـة ٢٠٢٠-٢٠٢١.وأوضـح الملا في تصريحـات لوكالـة رويـترز الاخبارية أن "دعم المـواد البترولية هبط إلى ٨,٤ مليـار جنيـه (٥٣٧,٨ مليـون دولار) في النصـف الأول مـن ١٤,١ مليـار جنيه كانـت بالموازنة ومقابـل ١٥,٢٥ مليار جنيـه قبل عام". وتستهـدف وزارة الماليـة أن يبلـغ دعـم المشتقات البترولية للسنة الماليـة الحاليـة نحـو ٢٨,١٩٣ مليـار جنيـه.

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في إطار الدور الرائد الذي قامت به شركة السويس لمهمات السلامة المهنية SSO داخل قطاع البترول في المساهمة للتصدي للظروف التي تمر بها البلاد من إنتشار فيروس كورونا المستجد (Covid-19) وذلك بتصنيعها الكمامة القطنية المستدامة طبقًا للإشتراطات الفنية الصادرة من وزارة التجارة والصناعة والمعتمدة من الهيئة المصرية العامة للمواصفات والجودة، والتي كان لها أثر ومردود إيجابي داخل شركات القطاع.

وتماشيًا مع توجهات الدولة بتطبيق الإجراءات الإحترازية، تتشرف الشركة بتلبية إحتياج عملائها من شركات قطاع البترول بإضافة منتج جديد إلى سلسلة منتجاتها وهو توفير الكمامة الطبية ذات الإستعمال اليومي المغلفة أتوماتيكيًا (كمامة لم تلمسها يد) والمطابقة للمواصفات المعتمدة من منظمة الصحة العالمية ووزارة الصحة المصرية والتي أجتازت كافة الإختبارات المطلوبة وبأسعار تنافسية عن مثيلتها داخل السوق المحلي.

ولن يتوقف التعاون إلى هذا الحد، ولكن تطبيقًا لتعليمات السيد معالي وزير البترول والثروة المعدنية السيد المهندس/ طارق الملا بضرورة توفير ملابس العمل المقاومة للحريق حفاظًا على سلامة العاملين، فكان لشركة السويس لمهمات السلامة المهنية SSO الريادة في هذا المجال بتوفير تلك الملابس المستحدثة ضمن منتجاتها بالشكل والجودة والمواصفات المطلوبة والتي توفر الحماية الكاملة لزملائنا العاملين داخل القطاع وبأسعار تنافسية تختلف عن مثيلتها المتوافرة بالسوق المحلي.

ولم يتوقف حلم الشركة في تطوير منتجاتها لتوفير مهمات السلامة الشخصية للعاملين داخل مواقع وحقول الشركات فقط، بل كان الحلم بأن نقوم بتوفير الملابس المظهرية لكوادر الصفوف الأولى من شركات القطاع متمثلة في (زي الإدارة العليا) وبالفعل تم تحقيق هذا الحلم وبداية الإنتاج لزي الإدارة العليا للعديد من شركات القطاع.

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