EGYPT OIL&GAS NEWSPAPER

Celebrating 15 Years OF CONTINUED GROWTH & SUCCESS

EXCLUSIVE INTERVIEW

APACHE AND EGYPT: MODERNIZING EGYPT'S ENERGY FUTURE

AN INTERVIEW WITH

JOHN J. CHRISTMANN IV

CEO AND PRESIDENT, APACHE CORPORATION

Apache

PROUDLY THE OFFICIAL PUBLICATION

EGYPS EGYPT PETROLEUM SHOW

14 - 16 February 2022 | Egypt International Exhibition Center

EDITOR'S LETTER

EGYPT OIL&GAS NEWSPAPER
EGYPT'S LEADING OIL & GAS MONTHLY PUBLICATION

EGYPS 2022: Dialogue Engagement and Partnerships Creation

Egypt Petroleum Show (EGYPS) 5th edition will take place from 14-16 February 2022. It has been two years since the last edition of the show. The global oil and gas industry faced many challenges during this period, due to COVID-19 pandemic. Yet, The Egyptian petroleum industry succeeded in making remarkable achievements regardless the international hazards.

EOG's February issue is dedicated to discuss the latest upstream updates in the Egyptian petroleum industry. We are pleased to have the chance to meet with Apache CEO John Christmann to learn more about the company's role in Egypt and the region. Christmann shared with us the secrets behind Apache's success story in Egypt over the past 25 years.

Our Research and Analysis team prepared a full report analyzing the performance of the oil and gas industry during the COVID-19 pandemic. It includes the global market movements and also highlights Egypt's oil and gas sector performance. The technology section discusses the electrochemical redaction of carbon. While the energy economics section highlights both investors and governments efforts in the field of hydrogen economy. The political section sheds lights on the Russian-Ukrainian tensions and its implications on the global energy market.

Wishing you an informative read!

MAHINAZ EL BAZ
Acting Editor-In-Chief
Research & Analysis Manager

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TOP 5

EL MOLLA ANNOUNCES RESULTS OF FIRST INTERNATIONAL DIGITAL BID ROUND FOR OIL AND GAS EXPLORATION

Minister of Petroleum and Mineral Resources Tarek El Molla announced the results of the first international digital bid round for oil and gas exploration and production (E&P) in the Mediterranean, Western Desert, and the Gulf of Suez.

Eight blocks with a total area of about 12,300 square kilometers (two in the Mediterranean, four in the Western Desert, and two in the Gulf of Suez) were awarded to Eni, BP, Apex International, Energean Egypt, Ina Nafta, Sipetrol, and United Energy, at a minimum investment cost of approximately $250 million during the exploration phases. This is in addition to the $23.7 million signature bonus.

Most importantly, the companies are required to drill a minimum of 33 wells. El Molla also indicated that in light of the current global conditions related to the coronavirus pandemic, this bid has achieved positive results that will attract more investments during the coming period.

EL SISI INAUGURATES HIGH-OCTANE BENZENE COMPLEX IN ASSIUT

President Abdel Fattah El Sisi inaugurated the high-octane benzene producing complex in Assiut. The petroleum products' total consumption of the ten governorates in Upper Egypt amounts to 20% of Egypt's total consumption, Minister of Petroleum and Mineral Resources Tarek El Molla noted.

El Molla explained that the total production of the new benzene production complex is 800,000 tons annually with various types of benzene, representing 13% of Egypt's total production and covering 100% of Upper Egypt's consumption and needs.

Egypt's local production of benzene increased by 55% from about 3.9 million tons in 2014 to 6 million tons in 2021, as a result of three major projects, including the new project in Assiut, the Egyptian Refining Company's (ERC) Mostorod refinery, and the expansions of the ANRPC plant in Alexandria.

EL MOLLA APPROVES EVALUATION RESULTS FOR THE MIDDLE MANAGEMENT PROGRAM'S SECOND BATCH

Minister of Petroleum and Mineral Resources Tarek El Molla approved the results of the final evaluation phase for the second batch of the Middle Management Program.

The results link was sent to the emails of the applicants for the program. Initially, around 80 applicants had registered for the program at the testing committee's headquarters at Assiut Oil Refining Company (ASORC).

MINING SECTOR'S CONTRIBUTION TO EGYPT'S GDP TO RISE TO 5% OVER NEXT TWO DECADES

Minister of Petroleum and Mineral Resources Tarek El Molla aims to raise the contribution of the mining sector to the gross domestic product (GDP) to 5% over the next two decades.

The Executive Director of the Development Partner Institute Wendy Tyrrell moderated the session, which was attended also by Saudi Minister of Industry and Mineral Resources Bandar Al Khorayef, Nigerian Minister of Mines and Steel Development Olamilekan Adegbite, Moroccan Minister of Energy Transition and Sustainable Development Leila Benali, and others.

For his part, El Molla indicated that Egypt is developing a number of mining cities through a clear vision that coincides with the government plans to improve the infrastructure. This is one of the important aspects of the mining sector development strategy implemented by the Ministry.

He further explained that some industrial cities will be established in the Eastern Desert and Sinai in order to maximize the added value of the mineral wealth. This is in addition to implementing phosphate fertilizer complexes and training and capacity building centers.

To pump more investments, the government immediately changed the legislation, regulations, laws to become more flexible and in accordance with international practices in the mining industry. As a result, the first international bid round was a success as 11 companies were awarded the exploration rights in the offered concessions.

EGYPT TO ESTABLISH ITS FIRST GOLD REFINERY WITH INVESTMENTS OF $100M

Egypt intends to establish its first gold refinery with costs reaching $100 million as a part of its strategy to develop its mining sector, Minister of Petroleum and Mineral Resources Tarek El Molla told Al-Sharq on the sidelines of the Future Minerals Forum held in Saudi Arabia.

The minister declared that this project has not been started yet, but they are structuring the company which will be responsible for this refinery. This refinery will serve the region as a whole.

El Molla clarified that the sector's development projects will be funded by the government, private sector, and international development organizations. He added that Egypt is producing around 15 tons of gold annually from the Sukari Gold mine and still has great potential in the Red Sea and South Egypt.

El Molla referred to Egypt's efforts to increase the mining sector's contribution to the gross domestic product (GDP) to 5% over the next two decades.

A BLAST FROM THE PAST

In February 1996, the Car Gas Company established the first center to supply and transfer vehicles to run on natural gas. Thus, Egypt became the first country in the Middle East to use natural gas as a fuel for vehicles.

Egypt continued its efforts to encourage vehicles owners to convert to compressed natural gas (CNG)-fueled vehicles or to use dual-fueled ones, which can use either benzene or CNG as a fuel.

In 2020, President Abdel Fattah Al Sisi launched an initiative to expand the use of natural gas as a car fuel. In 2021, the Egyptian Cabinet agreed to grant vehicles owners, who choose to benefit from the initiative, a 10% discount on the price of a new car, up to EGP 22,000 for private cars. As for taxis, owners will be granted a 20% discount, up to EGP 45,000, while microbus owners will benefit from a 25% discount, up to EGP 65,000.

Until the end of 2021, a total of 405,000 cars have been converted since the beginning of this initiative, while 530 CNG-fueling stations were completed. Additionally, for the first time in Egypt and the Middle East, the petroleum sector introduced in 2021 fully operational mobile fuel stations, which will offer motorists CNG and other services in busy areas of the country.

NUMBER OF THE MONTH

In January **2022**, Minister of Petroleum and Mineral Resources Tarek El Molla announced the results of the first international digital bid round for oil and gas exploration and production (E&P) which was launched in February **2021**.

Two of the awarded blocks are in the Mediterranean, four are in the Western Desert, and the last two are in the Gulf of Suez. The blocks were awarded to seven international oil companies (IOCs); Eni, BP, Apex International, Energean Egypt, Ina Nafte, Sipetrol, and United Energy.

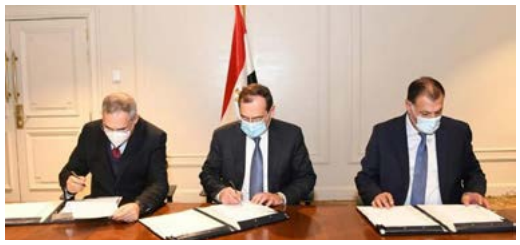
The awarded blocks total area is about **12,300** km^2. The awarded companies should afford a minimum investment cost of approximately **$250** million during the exploration phases to drill a minimum of **33** wells. This is in addition to the **$23.7** million signature bonus.

AGREEMENTS

EGPC, ENI SIGN $1B AGREEMENT FOR OIL EXPLORATION IN GULF OF SUEZ, NILE DELTA

The Egyptian General Petroleum Corporation (EGPC) and Italian energy company Eni have signed an agreement worth at least $1 billion for oil exploration activities in the Gulf of Suez and the Nile Delta.

The agreement was signed by Minister of Petroleum and Mineral Resources Tarek El Molla, EGPC Chairman Abed Ezz El Regal, and Eni CEO of Natural Resources Activities Alessandro Politi.



According to the agreement, Eni will pump a minimum of $1 billion in investments and will also spend an additional $20 million to drill four wells. The Ministry elaborated that this deal is part of its effort to boost production and to tackle the natural decline in wells by using the latest technologies.

The Ministry of Petroleum and Mineral Resources said that it also seeks to encourage its partners to invest more in oil and gas exploration and research activities.

EGYPT SIGNS CONTRACT FOR THE INTERNATIONAL METHANOL COMPLEX CONSTRUCTION IN SOKHNA

General Authority for Suez Canal Economic Zone (SCZONE)'s Chairman Yehia Zaki witnessed the signing of the contract for the establishment of the "International Company for Methanol and Its Derivatives" project, the largest integrated industrial complex for the production of methanol, ammonia, and its derivatives at Ain Sukhna's industrial zone.

The project comes within the framework of achieving the authority's strategy 2020-2025, which is based on the localization of specific industries within its regions, including the petrochemical sector industries within the integrated Sokhna region.

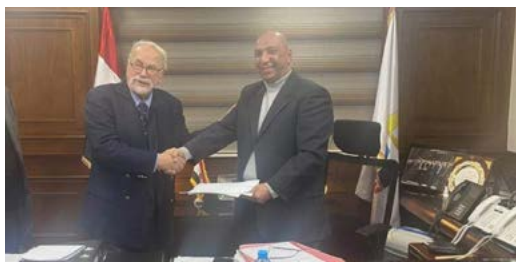
The project aims to establish an integrated industrial complex for the production of methanol and ammonia. It will be built on an area of 2 million square meters within the geographical area of the main development company, one of the most important developers of the economic zone in the southern sector of Ain Sukhna.

In addition, the project has storage areas in Sokhna port, with an area of 50,000 square meters, to achieve the required integration between the industrial zone and the port, at a cost estimated at $2.6 billion.

PETROMAINT TAKES MORE STEPS TO ENHANCE COOPERATION WITH INTERNATIONAL COMPANIES

Alexandria Petroleum Maintenance Company's (Petromaint) Chairman Ahmed Fouad signed a cooperation agreement with US company Fox & Waterman, which offers design, construction, and installation services in the fields of petrochemicals, refineries, water treatment, sewage, and industrial facilities.

This came as a part of the company's policy to enhance joint cooperation with foreign companies.



Meanwhile, a delegation from the Spanish company Novargi visited Petromaint's workshop in Al-Nahda area in Amreya, Alexandria. The visit aimed to receive the works of manufacturing the furnace, which is being carried out at Petromaint's workshop, for the benefit of GASCO and the general contractor for the project, Engineering for the Petroleum & Process Industries (Enppi).

Additionally, Novargi's delegation inspected the capabilities of the workshop's equipment and skilled technical labor, in order to benefit from the workshop in the future in many other projects related to various manufacturing operations.

EGYPT SIGNS TWO E&P AGREEMENTS WITH $506M IN INVESTMENTS

Minister of Petroleum and Mineral Resources Tarek El Molla signed two new agreements with TransGlobe and Pharos Energy to explore, develope and produce petroleum in several regions in the Eastern and Western Desert, with a total minimum investment of $506 million, and a signature bonus of $67 million to drill 12 wells.

The two agreements were also signed by Egyptian General Petroleum Corporation (EGPC) Chairman Abed Ezz El Regal, TransGlobe Energy Country Manager and Director Craig Robertson, and Pharos Energy General Manager Maged Abdel Halim.

The first agreement with the Canadian TransGlobe Company includes merging the regions of Northwest Gharib, West Gharib, and West Bakr in the Eastern Desert and pumping new investments for exploration, development, and production of crude oil.

Meanwhile, the second agreement with Pharos Energy aims to inject investments for exploration, development, and production of crude oil in the Fayoum region in the Western Desert.

The two agreements aim to increase crude oil production rates in light of agreeing to pump more investments in a number of concession areas and to use the latest technologies applied in the fields of exploration, drilling, and production. This contributes to increasing oil reserves and production in those areas, the Minister pointed out.

ACHIEVEMENTS

GAMEA INAUGURATES 18TH PLASTEX EXHIBITION FOR PETROCHEMICALS, PLASTICS

Minister of Trade and Industry Nevine Gamea inaugurated the 18th edition of Egypt's international plastics exhibition PLASTEX.

The exhibition is the largest domestic and regional event for business owners interested in the petrochemical and industries, Gamea said.

The 18th edition of PLASTEX lasted four days and had a total of 340 participating companies, including 270 foreign firms and 70 local manufacturers and exporters.

The companies that participated in the exhibition came from nine different countries, including China, India, the UAE, Saudi Arabia, Switzerland, Vietnam, Turkey, Germany, and Qatar.

PETROLEUM MINISTER INAUGURATES SUEZ PETROLEUM PIPELINE CONTROL ROOM

Minister of Petroleum and Mineral Resources Tarek El Molla has inaugurated the monitor and control room of the petroleum pipeline network in the Suez Canal region, including a radio thermoelectric generator (RTG) and control system for pumping units of Suez, Mostorod/Suez, and Portsaid pipelines.

He explained that the control room is developed and updated by petroleum companies using the latest international technologies, affirming the importance of such projects in providing accurate data to ensure quick decision-making in a timely manner.

The Chairman of Petroleum Pipelines Company (PPC) Mohamed Maged explained the five-year plan of the pipelines network, including the establishment of a number of pipelines to link the warehouses in Ras Badran, Ras Ghareb, and Ras Shukeir to the national grid. This also includes the construction of a pipeline connecting El-Sohkna to Upper Egypt, in addition to another pipeline to connect Lower Egypt and the Nile Delta to Upper Egypt, Suez, and Mostorod.

Also, the plan comprises the construction of a pipeline to link the warehouses in Agrod and Elsokhna to Mostorod. Furthermore, Maged showcased the digitalization projects implemented by his company.

INVESTMENTS

MIDOR NEW EXPANSIONS TO RAISE REFINERY CAPACITY BY 60%

Expansions in the Middle East Oil Refinery Company (Midor) aim to raise refinery capacity by 60%. The announcement came during Midor's board meeting under the chairmanship of the Minister of Petroleum and Mineral Resources Tarek El Molla. The meeting reviewed the implementation status of the expansion projects with an investment cost of $2.4 billion.

They also reviewed the commercial operational strategy of Midor in 2022. It aims to optimize the operation of all production units as well as provide various petroleum products to the local market. The refinery will be able to produce diesel with "Euro 5" specifications, using the modern and modified production units which will go through commissioning tests in mid-2022. It is worth noting that the final testing and commissioning for the production units will be completed by the end of 2022.

EGP 30B ALLOCATED FOR DEVELOPING PUBLIC PETROLEUM COMPANIES IN 2022/23

The Minister of Petroleum and Mineral Resources Tarek El Molla has announced that Egypt allocated EGP 30 billion, for the first time, for new investments by the petroleum companies affiliated to the public sector in the fiscal year (FY) 2022/23.

The announcement came during the general assemblies of the public companies held virtually via a video conference to approve the planning budget for the FY 2022/23 in attendance of the Minister of Local Development Mahmoud Shaarawy.

El Molla highlighted the ministry's efforts to leverage the petroleum projects efficiency in the different activities especially in developing the refineries and digital transformation as a part of the Modernization project.

For his part, Shaarawy praised the significant developments in the petroleum sector, referring to the importance of reporting such efforts to the public.

During the meeting, El Molla has approved the new investment budgets for Nasr Petroleum Company and Suez Oil Processing Company (SOPC).

BUDGET APPROVALS

CORC BUDGET FOR FY 2022/23 GETS MINISTERIAL APPROVAL

Minister of Petroleum and Mineral Resources Tarek El Molla chaired the Cairo Oil Refining Company's (CORC) general assembly meeting via video conference to approve the planning budget for fiscal year (FY) 2022/23.

El Molla confirmed that the developments in the Mostorod Refinery not only enhance its operational efficiency, but also contribute to supporting the safety system and digital transformation strategy. He called for efforts to be invested in the development of the petroleum geographical region in Mostorod, which would be in line with the volume of developments and investments that are pumped into the region's petroleum projects.

CORC's head Hisham El-Bakl delivered a presentation on the highlights of the company's investment budget during FY 2022/23, in addition to the targeted projects and work plans in its refineries in Mostorod and Tanta.

APACHE

APACHE TO SPEND $3.5B ON WESTERN DESERT OIL PROJECTS

The Ministry of Petroleum and Mineral Resources announced a new agreement with Apache, under which the company will spend at least $3.5 billion on research, exploration, development, and production activities in the concession areas in the Egyptian Western Desert.

The signatories of this agreement included Minister of Petroleum and Mineral Resources Tarek El Molla, the Egyptian General Petroleum Corporation (EGPC)'s Chairman Abed Ezz El-Regal, and Apache Vice President and General Manager in Egypt David Chi.

The agreement comes within the framework of joint development and modernization efforts between the two sides by merging the concession areas of Khalda Petroleum Company and Qarun Petroleum Company, which operate on behalf of EGPC and Apache. This contributes to raising efficiency, optimal investment of capabilities, and achieving excellence in light of the current changes.

The agreement paves the way to maximize production rates of crude oil and natural gas as they agreed to pump more investments in the concession areas in the Western Desert and expand using the latest technologies applied in the fields of research, drilling, and production.

ENI

ENI AWARDED FIVE EXPLORATION LICENSES IN EGYPT

Eni has been awarded five new exploration licenses in the Egyptian offshore and onshore by the Ministry of Petroleum and Mineral Resources.

The licenses are located in the Eastern Mediterranean Sea (Blocks EGY-MED-E5 and EGY-MED-E6), the Gulf of Suez (Block EGY-GOS-13), and the Western Desert (Blocks Egy-WD- 7 and EGY-WD-9). The total acreage is about 8,410 sqkm.

It is worth noting that Eni is the operator at four licenses. It acquired 50% of the exploration rights of blocks EGY-MED-E5 and Egy-WD- 7 equally with BP and APEX International Energy, respectively. In addition, Eni subsidiary (IEOC Production BV) has 100% interest in blocks EGY-MED-E6, EGY-GOS-13, and EGY-WD-9.

"The licenses are placed within prolific basins with proven petroleum systems able to generate liquid and gaseous hydrocarbons and can also rely on nearby existing producing and processing facilities and on a demanding market that will allow a quick valorization of the potential exploration discoveries," said the statement from the company.

ENERGEAN

ENERGEAN AWARDED EXPLORATION LICENSE IN WESTERN DESERT

An international consortium led by Energean Egypt (50% operator and Croatia's INA Nafta 50%) was awarded an exploration license for the East Bir El-Nus concession (Block-8) in the Western Desert of Egypt.

The award is in line with Energean's strategy to increase and diversify its presence in Egypt and reinforces its commitment to the country.

The scope of the license includes a 170km 2D seismic survey, a 200km2 3D seismic survey, plus two exploration wells, which are expected to target estimated resources of approximately 100 million barrels of oil equivalent (mmboe).

Energean provided an update on recent operations and the Group's trading performance in the 12-months to 31 December 2021 together with guidance for 2022.

On this occasion, Mathios Rigas, Chief Executive of Energean, commented: "2021 was an outstanding year for Energean, one in which we delivered excellent operational and record financial results. Production came in above initial expectations and we recognised all-time-high gas prices in Italy. As a result, we've generated full year revenues of over $495 million and EBITDAX in excess of $200 million."

ENAP SIPETROL

ENAP SIPETROL EGYPT AWARDED WITH WEST AMER BLOCK IN GULF OF SUEZ

Minister of Petroleum and Mineral Resources Tarek El Molla announced the results of the first digital international bid round for oil and gas exploration and exploitation in the Mediterranean, Western Desert, and the Gulf of Suez, in which ENAP Sipetrol has been awarded the West Amer Block in the Gulf of Suez.

ENAP CEO, Andres Roccatagliata, commented on that by stating: "This award is an important achievement for the company, which allows us to strengthen our exploration portfolio in Egypt, a country in which we have had very good results. This new block will allow us to generate significant income and an important increase of production in the country."

Chief Executive Officer of ENAP Sipetrol and General Manager of the Egypt Branch, Denisse Abudinen, also commented, "ENAP Sipetrol has been a partner in Egypt's growth for more than 23 years, and this award reaffirms our commitment to pursue high-quality opportunities in the country. We look forward to work with the government and deploy our proven expertise and advanced technology."

West Amer Block is located on the onshore central Gulf of Suez. It is in the vicinity of a grand prolific oil field, such as Bakr, and Gharib fields towards the East; and several scattered discoveries have been included recently in the area. The first oil discovery in the Gulf of Suez was in 1868. This province continues to promise considerable prolific exploration potential.

BP

BP AFFIRMS COMMITMENT TO INVEST IN DEVELOPING, FINDING NEW GAS SUPPLIES FOR EGYPT

BP acquired 50% of the exploration rights of the EGY-MED-E5 concession area, equally with Italy's Eni, the operator of the concession area, which "reflects and reaffirms our commitment to invest in developing and finding new gas supplies for Egypt," Karim Alaa, Regional President of BP North Africa, said.

"We've invested billions of dollars in building facilities and infrastructure over the years and this acreage ties in well with our resilient and focused gas strategy which aims to pursue development opportunities in proximity to our existing infrastructure, or to the infrastructure of our partners, which is likely to take less time and cost less to bring it online," Alaa added.

The company won the exploration rights in this concession area following its successful participation in the first digital global bid for gas exploration and exploitation in the Mediterranean.

The bid round had previously been announced by the Egyptian Natural Gas Holding Company (EGAS) through the Egypt Upstream Gateway (EUG) in 2021.

The concession is located about 130 km northeast of Port Said, and the concession area is about 3,200 square kilometers at a depth ranging between 500 and 1,200 meters.

UOG

UOG ANNOUNCES SUCCESS AT AL JAHRAA-13 DEVELOPMENT WELL

United Oil and Gas PLC (UOG) announced the discovery of commercial net pay at the Al Jahraa-13 (AJ-13) development well, located in Egypt's onshore Abu Sennan license.

According to the UOG's statement, this makes it the seventh successful well in a row at Abu Sennan since the company acquired its interest in the license.

UOG further elaborated that AJ-13 well encountered a net pay of 17.5m in the oil-bearing at the lower and upper Bahariya reservoir targets. Moreover, the development well reached its total depth ahead of schedule.

"We have had outstanding results with our drilling campaign in 2021 with five out of five successful wells drilled at Abu Sennan this year. All of the wells have been brought into production quickly, generating cash flow for the Company. The 2021 drilling campaign has further de-risked the exploration potential at Abu Sennan and the development wells have provided further valuable data for future exploration drill targets two of which are included in the 2022 program; ASF-1X and AST-1X," UOG CEO Brian Larkin commented.

UOG ANNOUNCES PRODUCTION COMMENCEMENT AT AL JAHRAA-13 WELL

United Oil & Gas Company (UOG) announced successful test results and production from the Al Jahraa-13 development well ("AJ-13") in the Abu Sennan license, which is operated by Kuwait Energy Egypt.

The AJ-13 well has now been tied into the existing facilities and brought into production at an initial rate of approximately 600 barrels of oil per day (bbl/d) gross on a 48/64 choke. Furthermore, these results came in less than eight days from completion, thereby the well successfully ramped up production and revenue to the company.

It's worth noting that the AJ-13 well was tested with flow rates of 897 bbl/d and 0.95 million standard cubic feet per day of gas (mmscf/d) on a 64/64 choke; and 623 bbl/d and 0.47 mmscf/d gas on a 32/64 choke.

The well is the fifth and final well in the Abu Sennan 2021 drilling program. The ECDC-6 rig, used to drill the AJ-13 well, will now move to drill the ASD-2 development well, the first well in the 2022 campaign.

SHELL

SHELL EGYPT: PARTNER OF THE 4TH WORLD YOUTH FORUM IN SHARM EL-SHEIKH

Under the patronage of President Abdel Fattah Al Sisi, Shell Egypt has participated in the activities of the 4th edition of the "World Youth Forum 2021" held in Sharm El-Sheikh in South Sinai, from January 10 to 13.

Shell Egypt CEO Khaled Kassem said that the company's participation in the activities of this important event stems from the company's keenness to continuously cooperate with the Egyptian government in a way that facilitates achieving sustainable development, developing investments in the energy sector, and attracting more investments.

"Our participation this year [included] the company's cooperation with the World Youth Forum [which held] a workshop for the youth of the Forum for a training program titled 'NXplorers' on January 8 and 9, before the start of the forum's activities, to discuss the impact of the corona pandemic on the UN SDGs and the need to reconsider and review the 17 SDGs until 2030 in line with the new global changes caused by this pandemic," Kassem noted.

Shell discussed the future of energy during the forum's activities in a session titled 'Energy Pathways: Towards a Safer World'. This session aimed to examine the causes of the energy crisis and the effects of COVID-19 on the global energy map and its repercussions on the global economy, especially in developing countries.

APACHE AND EGYPT: MODERNIZING EGYPT'S ENERGY FUTURE

AN INTERVIEW WITH
JOHN J. CHRISTMANN IV
CEO and president, Apache Corporation

With Egypt progressing towards its goal of becoming a regional energy hub, investments and production have become more essential than ever to realizing this dream. As the biggest US investor and oil producer in the country, Apache plays a pivotal role in helping Egypt achieve this objective. Egypt Oil & Gas had the opportunity to meet with Apache CEO John Christmann to learn more about the company's role in Egypt and the region.

Apache's presence in Egypt has proven successful over 25 years. What has made you successful and what do you look forward to?

Apache has been a committed partner to Egypt and Egyptians for more than 25 years and we continue to see tremendous future opportunity here. We have relied on innovation, technology, and our talented team to improve efficiency as we explore for and develop oil and gas, maximize Egypt's energy resources, and help modernize Egypt's energy industry.

The modernized Production Sharing Contract (PSC) we recently signed with the Ministry of Petroleum and Mineral Resources is a win-win for Egypt and Apache; it incentivizes increased investment and production growth and places Egypt at the top of many attractive investment opportunities in our global portfolio. The PSC also reinforces Egypt's commitment to responsible economic development and public-private partnerships and will accelerate impactful ESG initiatives aligned with our focus areas of air, water, communities and people.

In addition to Apache's investments in oil and gas, we are committed to continue our investments in Egypt's future in other ways by supporting education, healthcare, and the most vulnerable communities. We are very pleased to have founded Springboard Girls Schools more than 15 years ago to provide educational opportunities to girls living in rural areas of Egypt. Springboard's 201 schools have helped approximately 15,000 girls learn to read and write. We also know that teachers bring school buildings to life, so we fund a teacher training program that aims to empower teachers with the essential knowledge and skills to provide quality education to students in community schools.

What are Apache's future global investment plans? Do you plan to tap into new markets?

We continue to advance robust oil and gas developments in Egypt, the U.S., and the North Sea. Our parent company, APA Corporation, has subsidiaries with exploration activities offshore Suriname and some very early work offshore the Dominican Republic. Suriname is particularly exciting for us. We have made a number of discoveries already, and there is much to look forward to on two large offshore blocks there.

We see Egypt as one of the most attractive global investment opportunities in our portfolio. In anticipation of the new PSC agreement, we increased activity from five to 11 drilling rigs in Egypt since the start of 2021 and plan to further increase to 15 in 2022. We also expect to increase gross capital investment in Egypt by approximately $235 million in 2022, including Sinopec's minority interest.

> *"Apache has been a committed partner to Egypt and Egyptians for more than 25 years and we continue to see tremendous future opportunity here. We have relied on innovation, technology, and our talented team to improve efficiency as we explore for and develop oil and gas, maximize Egypt's energy resources, and help modernize Egypt's energy industry."*

What are your views on the shift to a lower carbon future?

The oil and gas industry anchors the global economy and will for many years to come. The affordable, abundant, reliable energy we produce helps facilitate access to better healthcare, education, and higher standards of living. It can help the billions of people around the world who presently lack access to modern energy.

Some people describe what is taking place as an energy transition. We think of it more as energy expansion. We will continue to innovate to meet that future demand while minimizing environmental impacts – and a big part of that will be by minimizing emissions. Our team is working on some specific initiatives for our operations in Egypt, and we look forward to announcing those soon.

How does Apache plan to boost efficiency and enhance production from the Egyptian fields?

The key to long-term success is the continuous replenishment of opportunity inventory, and this has been a focus for Apache. We have completed the acquisition portion of a multi-year, multi-million acres state-of-the-art new broadband 3-D seismic project in the Western Desert and have also reprocessed a large amount of vintage seismic data. We have used that subsurface picture to high-grade existing targets and identify new ones. With that information, we have achieved a drilling success rate of 93% and look forward to continued success. One specific example of our success is in the Matruh Basin, where we discovered a record 555 feet net pay at Herunefer E-2.

Of course, we also continued to optimize the efficiency of our operations. Lowering our cost per barrel not only improves margins and allows for increased reinvestment, it also turns more resources into economic reserves, which is critical for the sustainability of the business.

What are Apache's insights for Egypt's vision to become a regional energy hub?

Egypt is in a great place – in terms of resources, location, and leadership – to provide the energy that helps elevate lives across the globe. Egypt's leadership role in MENA and the Mediterranean region makes it well-suited to serve in the capacity of an energy hub and meet long-term demand in the Mediterranean, Africa, and other markets such as Europe. And the benefit will go beyond economic. Egypt serving as an energy hub in the region will bring nations together and should provide greater political stability.

How does Apache promote U.S.-Egypt economic cooperation?

As the largest oil producer and American investor in Egypt, Apache serves as a bridge between our two countries and promotes U.S.-Egypt business relations and economic cooperation. I've been privileged to chair the U.S. Egypt Business Council, an organization that plays an important role in advancing the bilateral economic relationship of our two great nations. Since its launch, the council has been a steadfast partner –working together with the government and private sector to grow the economy and expand our trade and investment ties that have put Egypt on a path of sustained economic progress and prosperity. We are honored to contribute to the country's ambitious economic growth plans and look forward to a bright future together.

> *"We see Egypt as one of the most attractive global investment opportunities in our portfolio. In anticipation of the new PSC agreement, we increased activity from five to 11 drilling rigs in Egypt since the start of 2021 and plan to further increase to 15 in 2022. We also expect to increase gross capital investment in Egypt by approximately $235 million in 2022, including Sinopec's minority interest. ."*

Apache supported the Hall of Ancient Egypt at the Houston Museum of Natural Science. Can you share why this important?

The newly remodeled Hall of Ancient Egypt at the Houston Museum of Natural Science opened in Nov. 2021, in conjunction with the world premiere of the touring Ramses the Great and the Gold of the Pharaohs exhibition. We were thrilled to support the exhibit and promote Egypt's vast, rich cultural heritage and the significant historical wonders of Egypt's ancient civilization for the American public.

Recently, I had the opportunity to visit the Hall of Ancient Egypt with the Minister of Petroleum and Mineral Resources H.E. Tarek El Molla. I was in awe of the rich history showcased throughout the exhibit and enjoyed learning more about the diverse aspects of ancient Egyptian life.

> *"As the largest oil producer and American investor in Egypt, Apache serves as a bridge between our two countries and promotes U.S.-Egypt business relations and economic cooperation."*

What do you look forward to during your trip to Egypt and EGYPS 2022?

I always enjoy visiting Egypt. I look forward to meeting with Apache employees and thanking them for all they do for Egypt, our company, and others around the world.

The EGYPS Petroleum show is an exciting opportunity to hear from other companies and leaders and discuss the future of the energy industry in Egypt.

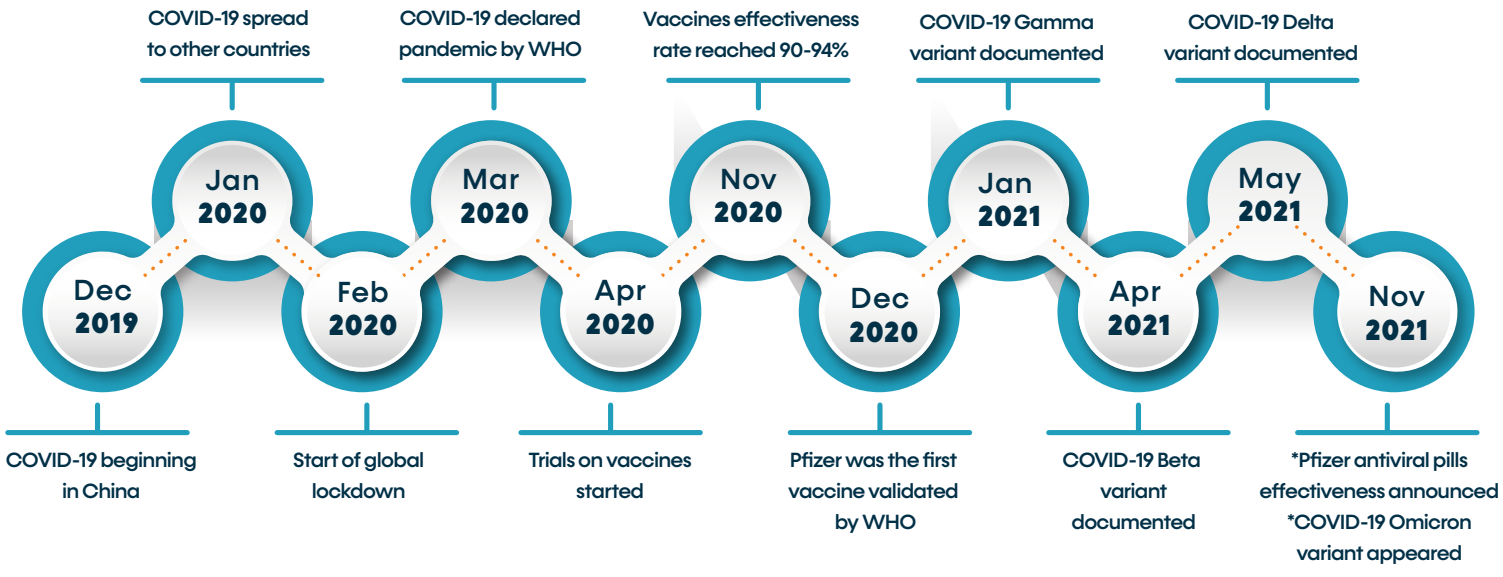
At this year's show, we're excited to highlight two areas that are very important to us – safe operations and the advantages of a diverse team – by sponsoring the HSE Best Project of the Year award and the Nex-Gen Female of the Year award. I look forward to seeing everyone at the show and sharing my optimism for the future of the energy industry in Egypt.

OIL & GAS MARKET DURING COVID-19 PANDEMIC: HIGHLIGHTING EGYPT'S PERFORMANCE

BY AMINA HUSSEIN, REHAM GAMAL & YOUSTINA MOUNIR

COVID-19 KEY MILESTONES AFFECTING INTERNATIONAL OIL & GAS MARKET

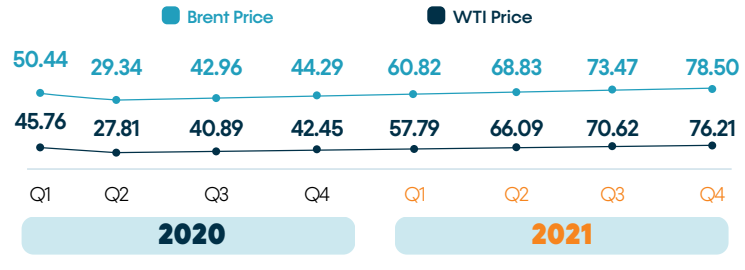
COVID-19 MAIN DEVELOPMENTS



COVID-19 EFFECTS ON INTERNATIONAL OIL & GAS MARKET

1. PRICES FLUCTUATIONS

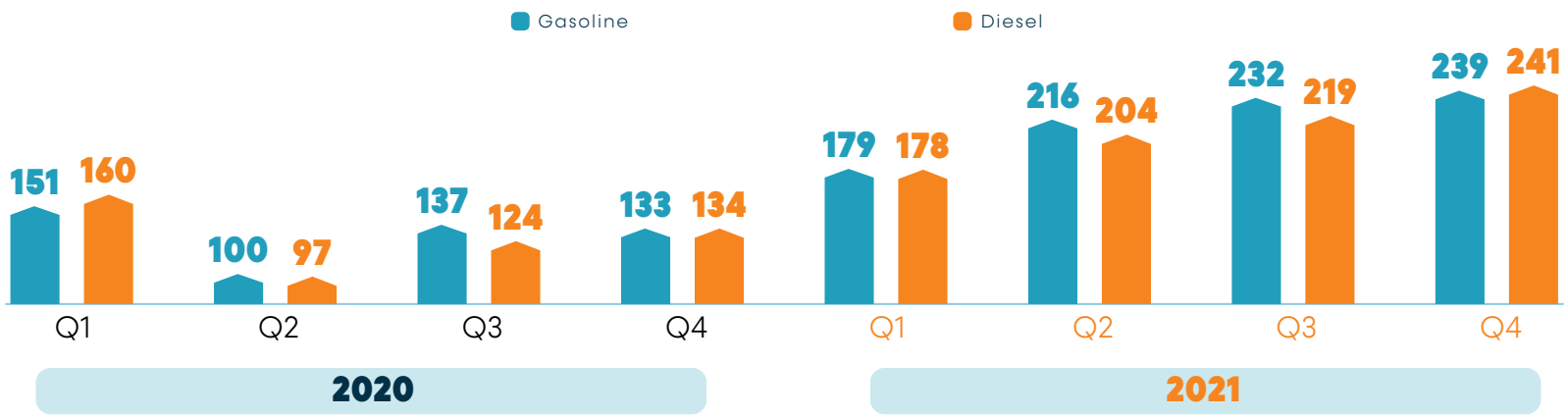
CRUDE OIL PRICES ($/bbl)



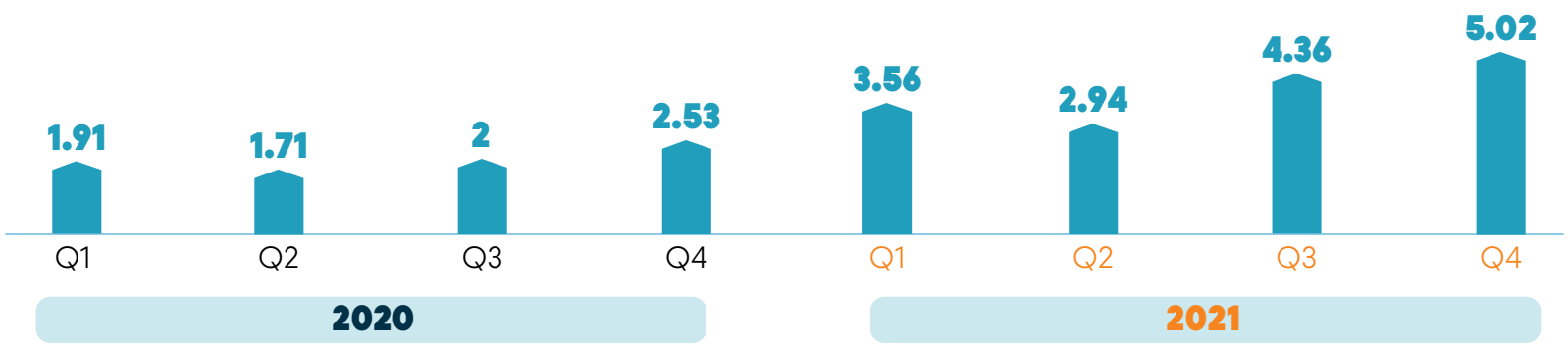
HIGHLIGHTS ON CRUDE OIL PRICES

Date	Level	Prices ($/bbl)
20 Apr, 2020	Lowest	-36.98
26 Oct, 2021	Highest	85.64

FUEL PRICES (Cent/Gallon)



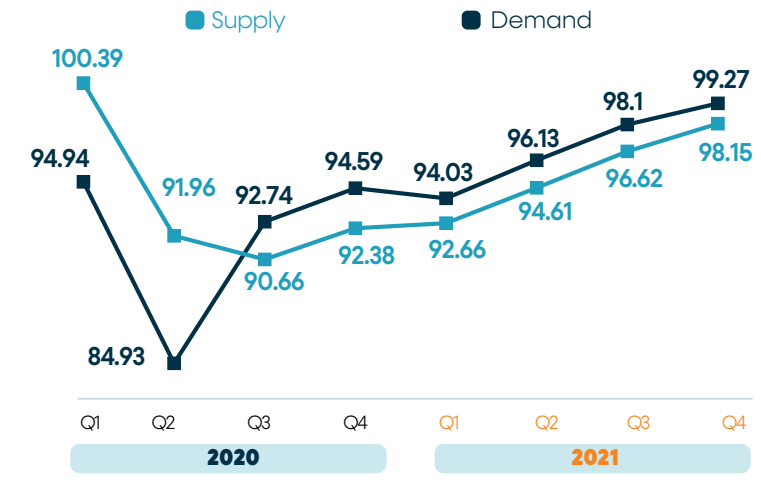
NATURAL GAS PRICES ($/Btu)



2. OIL & GAS SUPPLY, DEMAND & INVENTORIES

A. OIL & OTHER LIQUIDS

INTERNATIONAL PETROLEUM AND OTHER LIQUIDS SUPPLY & DEMAND (mmbbl/d)

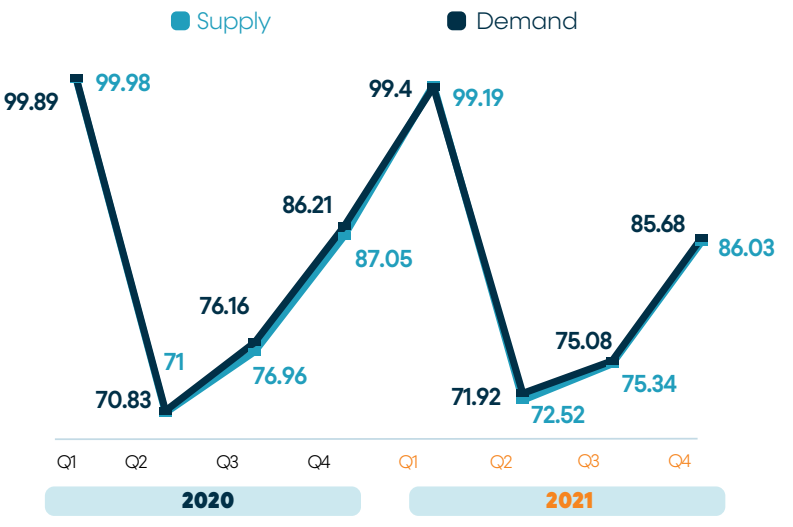


AVERAGE GLOBAL OIL INVENTORIES (mmbbl/d)

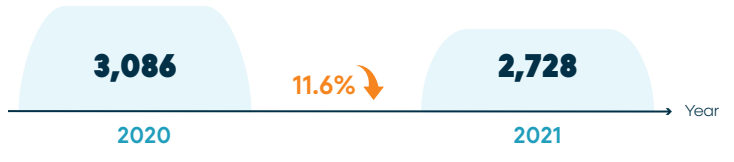
Year	Inventories	
2020	Increased by	2.1
2021	Decreased by	1.4

B. NATURAL GAS

US NATURAL GAS SUPPLY & DEMAND (bcf/d)



AVERAGE NATURAL GAS INVENTORIES* (bcf)



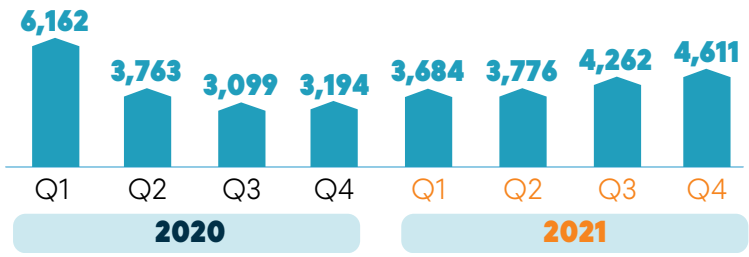
*US Working Natural Gas

3. WORLD RIG COUNT

AVERAGE WORLD RIG COUNT

2020		2021
1,352	↑ 0.67%	1,361

WORLD RIG COUNT IN 2020 VS. 2021



EGYPT'S OIL & GAS SECTOR PERFORMANCE

1. SECTOR'S GDP

PETROLEUM SECTOR GDP OVER FYS (2019/20-2020/21)

Total Petroleum GDP	EGP **1,151.4** billion

Sector's Share in Total GDP	**9.9%**

NEW DISCOVERIES

Crude Oil	Natural Gas	total
86	28	114

2. EXPLORATION ACTIVITIES

A. BID ROUNDS

EUG BID ROUNDS IN 2021

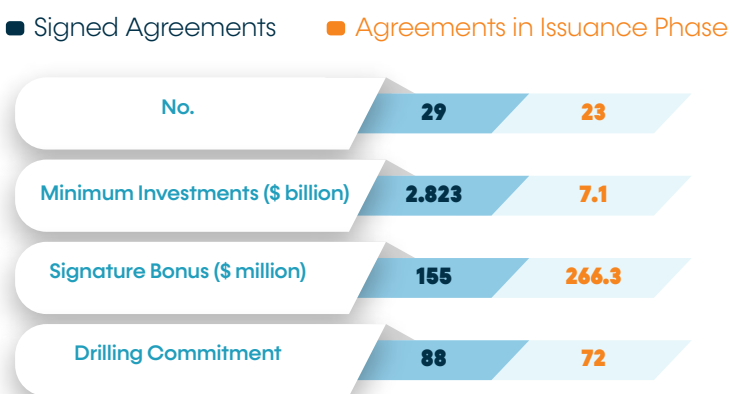
Launched Bid Rounds	Start Date	Concessionaire	Location	Closing Date
2	Feb 2021	EGPC & EGAS	Eastern & Western Mediterranean Western Desert Gulf of Suez **24** Offered Blocks	Sep 2021
1	Nov 2021	EGAS	North King Mariout	Jan 2022

SIGNED DEVELOPMENT LEASES

Signed Leases	Location	Signature Bonus
29	Western Desert Eastern Desert Nile Delta	$**13.5** million

B. PETROLEUM AGREEMENTS, DISCOVERIES & DEVELOPMENT LEASES OVER 2020 & 2021

SIGNED AGREEMENTS & AGREEMENTS IN ISSUANCE

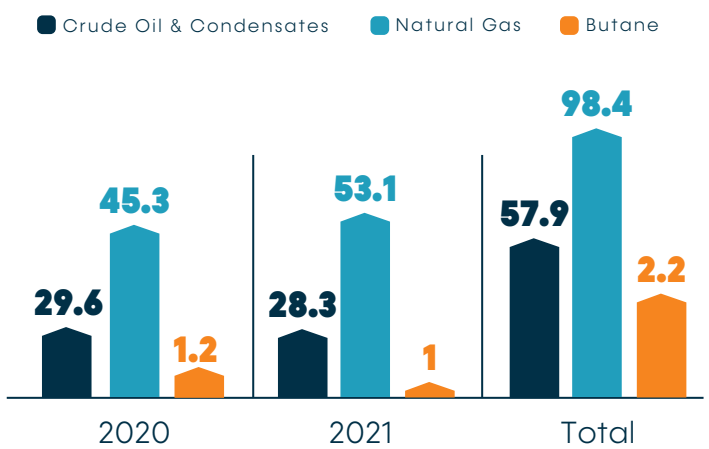


C. PRODUCTION LEVEL

TOTAL PRODUCTION OVER 2020 & 2021

158.4 mmt

PRODUCTION PER PRODUCT (MMT)



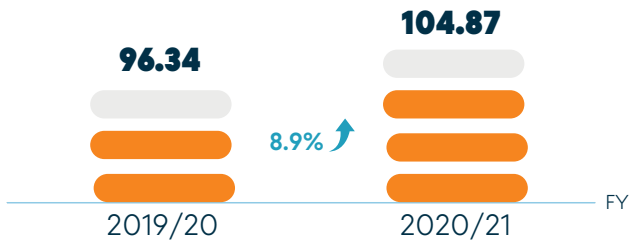
4. INVESTMENTS & ARREARS

A. INVESTMENTS

PETROLEUM SECTOR INVESTMENTS OVER FYS (2019/20-2020/21)

Total Petroleum Investments	EGP **201.213** billion
Sector's Share in Total Investments	**12.9%**

PETROLEUM INVESTMENTS PER FY(EGP billion)



B. ARREARS

ARREARS TO IOCS ($ billion)

The lowest since **FY 2011/12** whereas arrears declined by **86.6%**

INTERNATIONAL OIL & GAS MARKET INSIGHTS IN 2022 *

1. OIL & GAS PRICES

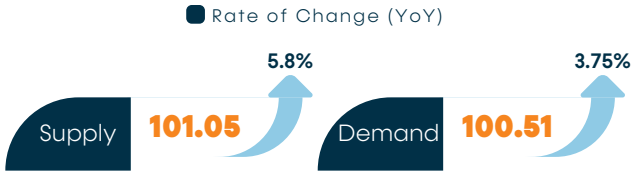
ESTIMATED AVERAGE OIL & GAS PRICES

Product	Price
WTI ($/bbl)	66.46
Brent($/bbl)	70.08
Gasoline (cent/gallon)	206
Diesel (cent/gallon)	211
Natural Gas ($/Btu)	3.98

2. OIL & GAS DEMAND, SUPPLY & INVENTORIES

A. OIL & OTHER LIQUIDS

AVERAGE INTERNATIONAL PETROLEUM AND OTHER LIQUIDS SUPPLY & DEMAND (mmbbl/d)

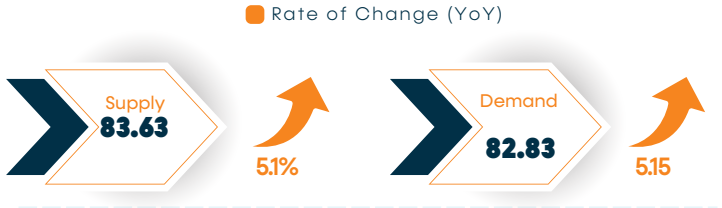


AVERAGE GLOBAL OIL INVENTORIES

AVERAGE END-OF-PERIOD COMMERCIAL CRUDE OIL AND OTHER LIQUIDS INVENTORIES

B. NATURAL GAS

AVERAGE US NATURAL GAS SUPPLY & DEMAND (BCF/D)



AVERAGE NATURAL GAS INVENTORIES

* **Source:** U.S. Energy Information Administration (EIA).

TRANSITIONING THE OIL AND GAS INDUSTRY TO LOW-CARBON

BY RANA AL KADY

To begin with, although a rising number of oil and gas businesses are committing to net-zero targets, not all are sure how to get there. With that, energy transition is viewed by oil and gas companies as a mixed bag of possibilities, hazards, and a complicated phenomenon. The current crisis has demonstrated how sensitive the global economy is to underlying threats, one of which is climate change. Even before COVID-19, there was growing demand to transform the energy system away from one dominated by hydrocarbons further towards one driven by low-carbon sources.

THE TREND TO TRANSITIONING TO LOW CARBON

The transition to a low-carbon future may release a multiplier effect and build a new equation for businesses across the spectrum, regardless of timescales. Companies that strike a balance between internal change and corporate strategy, allow for innovation and agility, and build a solid "low-carbon" basis are generally on the right trackAs per the law of supply and demand, energy demographics, and the responsibilities of all corporations in the energy value chain to reduce emissions, oil and gas will probably continue to play a part in the energy mix for years to come. The changeover, on the other hand, is not that simple. Even altering hydrocarbon needs would be difficult without a shift in the primary resource requirements of numerous industries outside of the energy industry.

The interaction of energy transition with conventional hydrocarbons generates a range of possibilities that may be categorized under four categories: (i) hydrogen trailblazers, (ii) low-carbon developers, (iii) green enthusiasts, and (iv) net-zero innovators. Low-carbon developers and hydrocarbon trailblazers continue to focus on fossil fuel production, while net-zero innovators and green enthusiasts are focusing on renewables and sustainable energy. Each category's success measures are distinct, but they are all consistent with the processes required to be a "winner" in that category. A net-zero innovator, for instance, will be concerned with asset divestitures, but a low-carbon producer will be focused with decarbonization field activities.

Each low-carbon oil and gas category considers different roles and focuses points. For example, hydrocarbon trailblazers are essentially concerned with acquiring a share of the market and developing their petrochemical company in zones that have the least upstream expenses and the lowest compliance risk. Consequently, low-carbon developers have a primary goal to create a compact, efficient, and decarbonized hydrocarbon resource. Furthermore, green enthusiasts engage with the new oil sector following the monetization of hydrocarbon assets and the commercialization of clean technology. Finally, net-zero enthusiasts are focused on establishing a new energy-heavy strategy by liquidating the majority of their hydrocarbon company and would be the first to fully accept the green revolution.

STRATEGIC INFLUENCE

Furthermore, a brand may shift between these categories as time goes on: a low-carbon developer may eventually become green enthusiasts. The function of each category will likely become more essential as the market matures, as the sector strives to fulfill both growing energy demand and climate goals. As suggested by a Sustainability Advisor in the Energy Sector, "we [Egypt] have many goals in terms of carbon emissions and implementing renewable energy in our projects in the oil and gas sector. However, the only way our companies can achieve these goals is for us to slowly add these new ideas and technologies in our operations and shifting without stopping operations in one go."

The net-zero mindset is real, and it's just going to get stronger. Apart from authorities devising policies to encourage a shift to a lower-carbon future, the business promises to attain net-zero objectives are flooding in, with an increasing number of oil and gas corporations joining the race. These commitments show that the global energy sector is about to experience transformative changes, regardless of the time frame—2030, 2040, or 2050. This might represent a variety of things, but most notably, it indicates a lower role for fossil fuels in the energy supply, a bigger percentage of renewables in the energy mix, more consumer trends, and higher levels of incorporation and rivalry for low carbon technologies.

CASE STUDIES

It should be noted that Exxon Mobil, BP, Shell, and other big oil giants are all vowing to plan for a low-carbon or "lower-carbon" future under severe pressure. Recent triumphs for climate activists include the election of three new members to Exxon's board of directors, a clear rebuke to Exxon's oil-centric investment plans, and a judgement from a Dutch court forcing Shell to reduce emissions.

However, there is no agreement on how a world with less petroleum would appear to firms that have benefited immensely from the carbon fuels that are causing climate change. European firms such as Total, a French giant, and bP, located in the United Kingdom, are betting big on a shift away from oil and toward renewable energy. Meanwhile, American conglomerates are betting modest quantities on more fledgling systems like carbon capture, with no intentions to abandon crude. Regardless of the amount invested in green power, most oil firms continue to put substantially more money into oil and gas-based initiatives, indicating that they don't anticipate a transformation to occur spontaneously.

To conclude, the concept of a net-zero mindset is real and it's just going to get stronger. Apart from governments devising policies to encourage a shift to a lower-carbon future, the business promises to attain net-zero objectives are flooding in, with an increasing number of oil and gas corporations joining the race.

A smaller oil market, which would be more competitive, would ultimately characterise the low-carbon era. Efficient processes and low production costs are projected to give enterprises that continue to focus on hydrocarbon production a strategic advantage. Organizations that leave the oil markets to look for new low-carbon business models will have to stand out in these new industries. Once the industry has mastered the interplay between economics and the environment, it will be able to easily succeed in the forthcoming energy market.

INVESTORS, GOVERNMENTS TURN THE WHEEL OF THE HYDROGEN ECONOMY

BY AMINA HUSSIEN, FATMA AHMED

In light of the necessary need for the energy transition, hydrogen becomes the current mainstream of interest all over the world, having the ability to play a key role in the future of energy. This pushed governments and investors to think about the economy of hydrogen. According to an article published by "The Guardian", hydrogen economy refers to the approach of using hydrogen as a low-carbon source of energy instead of the existing ones. The International Energy Agency's (IEA) "Future of Hydrogen" report stated that hydrogen can help in implementing the global goal of reducing emissions.

"Hydrogen can be used in a wide range of new applications as an alternative to current fuels and inputs, or as a complement to the greater use of electricity in these applications, for example in transport, heating, steel production and electricity – hydrogen can be used in its pure form, or converted to hydrogen-based fuels, including synthetic methane, synthetic liquid fuels, ammonia and methanol", the report explained. Furthermore, it can help in the rapid growth of using renewable electricity. This drives us to identify the market dynamics of hydrogen.

HYDROGEN'S MARKET DYNAMICS

Global Demand for Hydrogen

The demand for hydrogen in different industries has consistently increased from 2000 to 2020. The global demand in 2000 recorded around 60 million tons (mmt), while in 2020 the global demand reached 90 mmt, which represents a 50% increase, according to the EIA's "Global Hydrogen Review 2021" report.

The data represented in the report further show that the demand for hydrogen is dominated mainly by chemical and refining industries. Refineries consumed around 40 mmt of hydrogen either as a feedstock or as a source of energy. On the other hand, chemical industry consumed around 45 mmt of hydrogen in 2020, of which 75% were directed to ammonia production while 25% were mainly for methanol production.

Sources of Production

The global hydrogen demand was met by either fossil fuel-based hydrogen or by byproduct hydrogen. The fossil fuel-based hydrogen is generated from dedicated hydrogen production plants and represented 72% of supply in 2020, while the remaining 21% was generated in facilities designed primarily for other products, mainly refineries in which the reformation of naphtha into gasoline results in hydrogen, according to EIA's report. Natural gas is the main fuel for hydrogen production. In 2020, 6% of the global natural gas production, around 240 billion cubic meters (bcm), was dedicated to producing 60% of the global hydrogen in the same year.

Hydrogen Production Cost

Fossil fuels are the cheapest source available around the world to produce hydrogen, as the levelized cost of hydrogen produced from natural gas is in the range of $0.5-1.7/kg. On the contrary, producing hydrogen from renewable energy sources is much higher where it ranges from $3-8/kg. As for coal, the cost is considered average with a range of $1.2-2.2/kg. This led us to important questions about how to invest in hydrogen, whereas the governments can support the hydrogen economy and how they can do this.

AREAS OF INVESTMENTS

Investing in hydrogen can be carried out in different ways: either the infrastructure or research, development, demonstration and deployment, according to an article published by Columbia SIPA. Regarding infrastructure, many countries are investing in hydrogen production to reduce infrastructure costs. Moreover, research, development and deploying innovative technologies are needed to accelerate cost reduction, performance improvement, and adoption.

During the COVID-19 pandemic, hydrogen was remarkably resilient to the global economic slowdown. Over the period from January 2019 to mid-2021, companies for producing, distributing and using hydrogen were able to raise around $11 billion. Most new funding for hydrogen in 2020 and 2021 was raised by companies already listed on a stock exchange.

For example, Plug Power an American company that makes electrolyzers, fuel cells and refueling equipment had the largest share in raised funds with $4.8 billion. Even the investment in the risky early-stage start-up witnessed a boom, as the investments in these ventures totaled $1.24 billion over 2019-2020, according to the World Energy Investment 2021 report.

GOVERNMENTS' CRUCIAL ROLE

Dr. Romanas Savickas, an expert in hydrogen and energy efficiency, told Egypt oil and gas (EOG) that "the governments have to support the hydrogen investments, develop long-term roadmaps, and put the hydrogen besides other new technologies as renewables."

IEA's "Global Hydrogen Review 2021" report recommended five key areas of policy frameworks that governments adopt for developing hydrogen investments. The first is to establish long-term targets and determine the most efficient way to use hydrogen. The second is to create demand for low-carbon hydrogen and pull

investments to fund these projects. The third is to implement measures to reduce investments risks. The fourth is to develop policies that motivate private sectors to innovate and use new technologies.

The last one is to set standards followed while hydrogen deployment. For example, in 2019, Australia developed strategies to produce coal with carbon capture, utilization and storage (CCUS), electrolysis and natural gas with CCUS with investments $0.9 billion. Also, Canada developed a strategy in 2020 to produce biomass, oil and gas with CCUS and electrolysis with investments of $19 million. This is in addition to other countries like Chile, Russia, Japan, Korea and etc.

Moreover, international cooperation between countries' governments plays a significant role in this regard, which can motivate knowledge sharing and connect a wider group of investors on the best practices. Examples of such agreements include an agreement between Germany and Australia to develop technologies for the hydrogen industry; Morocco and Portugal cooperated on how to develop hydrogen from renewable sources; Singapore and New Zealand collaborated on establishing supply chains for low-carbon hydrogen.

HYDROGEN TRANSITION SETBACKS

Despite the enormous benefits of the hydrogen economy transition, it still suffers from several obstacles. Krzysztof Łokaj, sustainability and circular economy expert commented, "since hydrogen is fairly new as a fuel or energy storage, therefore, it comes with issues typical for a new product (lack of infrastructure, high production costs or underdeveloped market)". According to the IEA report, one of these challenges is the uncertainty of the low-carbon transition speed adopted by the government in different countries. Also, there is a lack of financial commitments to hydrogen technologies and infrastructure.

In addition, it is still unclear to determine the cost of hydrogen in different regions. Moreover, the regulations for hydrogen utilization are still not clear as well and don't allow exploitation of the full benefits hydrogen can provide. Our experts provided some recommendations in this regard. "The financial institutions, in this case, play a significant role by providing subsidies/grants for the research and innovation projects as well as technical-economical feasibility studies and also by providing support in the form of low-interest rate loans," Savickas said.

Łokaj affirmed the need for long-term impact of the hydrogen projects adding "obstacles of legislative nature caused by law not being able to keep up with new technologies may lead to serious delays or even decisions not to invest due to uncertain legislative environment."

For his part, Thomas Gael, energy economist, explained that "by 2030, some $300bn is to be invested in the entire sector, not just to deploy what remains an embryonic value chain, but also to achieve economies of scale to bring down costs right across this chain, from hydrogen's production to its various end-uses. Only part of the $300bn will be financed by the public sector, with $70bn committed by national governments to date, which underscores the extent of the challenge facing the sector and private finance."

In the same context, Samuel Ikemba, energy economist, said "role of financial institutions is to provide flexible repayment plan, help in conducting market research and guide investors through evidence-based decision making". Ikemba emphasized that policy support and cost are the main factors that affect hydrogen investment. He called on governments to review the existing inter-governmental resolutions such as the Paris Agreement and COP26 Summit at Glasgow.

FROM THREAT TO ASSET:
ELECTROCHEMICAL REDUCTION OF CARBON

BY YARA ALY

Awareness of climate change and the need for global action is increasingly widespread across the world. Scientists estimate that to mitigate the impacts of the changing climate, humanity must stabilize the atmospheric concentration of carbon dioxide (CO_2) at approximately 350 parts per million (PPM). Atmospheric CO_2 measured at the NOAA's Mauna Loa Atmospheric Baseline Observatory has reached a monthly average of 419 parts (ppm), the highest level since the start of the measurements in March 1958. At this point, governments and policymakers have resorted to carbon dioxide removal and utilization technologies, mainly electrochemical reduction, as the key to fulfilling the goal of net-zero greenhouse gas (GHG) emissions by 2050.

CARBON UTILIZATION

As climate concerns intensify, the world tends to explore advanced technologies to reduce emissions in hard-to-abate sectors, such as oil and gas, and also to draw down CO_2 levels in the atmosphere. High on the list comes carbon capture and storage (CCS), an umbrella term for a family of technologies and techniques that serve to remove/sequester CO_2 from the atmosphere and bury it underground in saline aquifers. With CCS, CO_2 is treated as a waste product that has to be disposed of properly, just as sewage and other pollution hazards.

Implementing CCS technology not only requires high capital and operating costs, but also has no economic benefits. Instead of being buried underground for long-term storage, the captured CO_2 can be used as a feedstock to produce value-added products. This process is known as carbon capture and utilization (CCU). Moving forward, CO_2 has many potential uses, either directly or indirectly by conversion. To manifest, the direct use of CO_2 has been practiced for decades with mature technologies in various industrial processes, such as CO_2-enhanced oil recovery. Additionally, there are many technological pathways for converting CO_2 into commercial products. Among all the proposed technologies, electrochemical process is considered to be the most promising.

ELECTROCHEMICAL REDUCTION

The electrochemical reduction of CO_2 is a complex conversion consisting of multiple elementary proton-electron reactions. It is based on the co-electrolysis of steam (H_2O) and CO_2 using solid oxide electrolysis cells (SOEC). Moreover, the process can be a viable alternative production route of syngas, which is the key building block of chemical industry. The syngas can then be converted into synthetic fuels, such as gasoline, diesel, and methane. It is worth noting that CO_2 electrochemical reduction is also realized under power-to-fuel technology.

For further illustration, the SOEC operates at high pressure (>1 MPa) and high temperature (>800°C). While CO_2 is converted at the negatively charged cathode to primarily CO, methane, ethylene, and formic acid, H_2O is oxidized into O_2 at the anode. After that, the resulting product, syngas (H_2 + CO), is converted via the Fischer–Tropsch process into long-chain hydrocarbons (-CH_2 -), known as Blue Crude, to produce fuels or chemicals. Most importantly, the Fischer–Tropsch process is exothermic, and thus the synthesis heat released can be used to vaporize water for steam electrolysis. The co-electrolysis of H_2O and CO_2 can achieve an efficiency of 70%, making it by far the best of all carbon utilization technologies.

OPPORTUNITIES & CHALLENGES

Electrochemical reduction is gaining traction as a cost-effective and economically driven technological pathway. This novel technology will reduce the dependency on fossil fuels for chemical synthesis, as it is possible to drive the process toward the desired products. To illustrate, the product distribution depends on the choice of electrolyte, the concentration of electrolyte and dissolved CO_2, and the reaction conditions. Furthermore, the electrolyte may be recovered for re-use, and hence the chemical consumption can be minimized.

However, several challenges have plagued the widespread adoption of the technology, including a lack of globally enforced carbon regulation, low practical carbon sequestration capacities, and capital and operating costs. Recently, many studies have been performed showing the techno-economic feasibility, sustainability, and social perception of CO_2 conversion technologies. Take, for instance, the EU's Energy program has developed a roadmap for the electrochemical reduction of CO_2, tackling both short-term and long-term goals and challenges.

EUG SUCCESS STORY: FIRST BID ROUND

BY SARAH SAMIR

As Egypt eyes attracting more investments to the oil and gas sector, the Egyptian General Petroleum Corporation (EGPC) launched a tender in November 2018 for establishing the country's first petroleum exploration and production (E&P) digital data repository. The Egyptian Upstream Gateway (EUG) is a national data bank, which comes as a part of the oil and gas sector's Modernization project. It aims to provide exceptional solutions that bring together data storage, visualization, analytics, and infrastructure along with seamless access provision and online data management. Through online data access, EUG tends to promote the oil and gas sector's bid-rounds digitally. EUG facilitates the day-to-day activities' operation, decision-making, as well as licensing rounds promotion.

Launching the First Digital Bid Round Despite COVID

As a result of the COVID-19 pandemic, it became difficult to launch new bid rounds and attract new investments. However, thanks to the EUG, Egypt was able to continue the success of its oil and gas sector. In August 2021, less than a year after the EUG Go-Live event in February, EGPC and the Egyptian Natural Gas Holding Company (EGAS) invited oil and gas exploration companies to take part in the country's first digital bid round. The exploration bid round included 24 blocks located in the Mediterranean Sea, Western Desert, and the Gulf of Suez, to be operated according to Egypt's production sharing agreements (PSA) model.

During the bid round promotion event, the EUG team provided technical presentations about the different included areas and showcased EUG's benefits, such as data availability, accessibility, and swiftness. Through the bid round, EUG provided international oil companies (IOCs) with virtual data rooms to empower them to evaluate the offered blocks remotely. Hence, the EUG successfully promoted the offered blocks and met the IOCs' confidence in the Egyptian oil and gas sector.

Win-Win Results

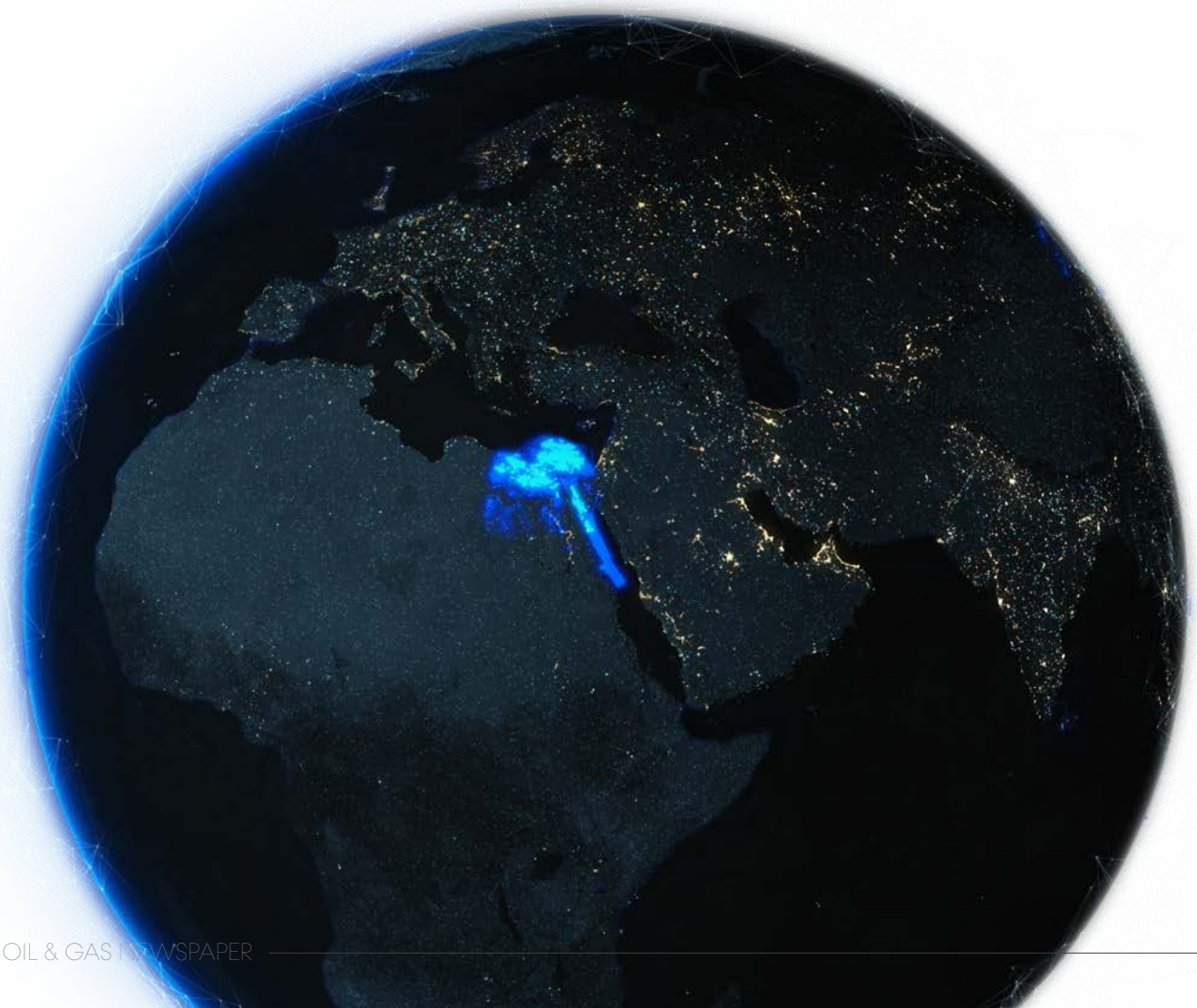
At the beginning of 2022, Minister of Petroleum and Mineral Resources, Tarek El Molla, announced the results of the successful first digital bid round for E&P. Eight blocks of a total area of approximately 12,300 square kilometers were awarded to BP, Eni, Energean Egypt, Apex International, Sipetrol, United Energy, and Ina Nafta at around $250 million minimum investment cost during the exploration phases, in addition to $23.7 million signature bonus.

The first digital bid round has been a win-win opportunity for both the Egyptian oil and gas sector and its private sector partners. While Egypt was able to promote its concession online, the oil firms were granted an opportunity to review all needed technical data and submit offers digitally, while preserving distance.

Regional President of BP North Africa, Karim Alaa, previously declared that winning a block in the bid round "reflects and reaffirms our commitment to invest in developing and finding new gas supplies for Egypt."

El Molla also indicated that amid the global conditions imposed by the coronavirus pandemic, the bid resulted in a positive outcome, attracting investments to the sector during the upcoming period.

EUG is a gate towards a promising future, where becoming digital is the easier, faster, and safer option. The success of the first digital bid round proves the confidence in the Egyptian oil and gas sector and the interest of petroleum companies to invest and explore Egypt.



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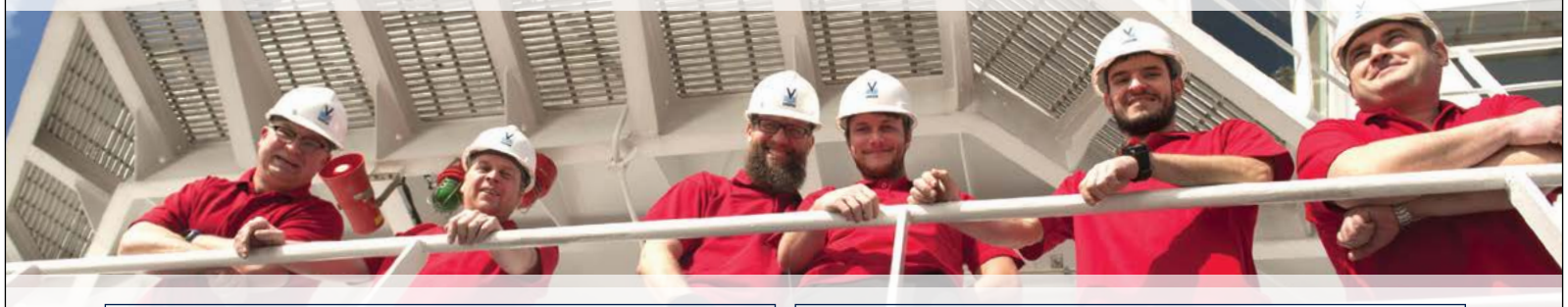

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WHAT IF RUSSIA INVADES UKRAINE?

BY IHAB SHAARAWY

The drums of war are beating louder in Europe as the West is accusing Russia of amassing more than 100,000 soldiers on the Ukrainian border and has threatened unprecedented sanctions if Moscow invades the former Soviet republic.

Although Russia denies any plans to invade, it has demanded security guarantees, which have been ignored by the West.

As Moscow sees "little ground for optimism" in resolving the crisis after the US rejected Russia's main demands and US President Joe Biden insists there is a "distinct possibility" Russia might invade Ukraine in February, the world is poised to the consequences of what seems to be a long and devastating conflict.

The potential invasion of Ukraine would have severe consequences that would be felt across the world markets and most importantly could put world energy security at stake.

THE UKRAINE STANDOFF

Russia has lately spent much time and effort to protect its own sphere of influence, where it sent troops to help the Russia-allied government in Kazakhstan to quell violent protests that saw the government lose control in the country's biggest city, Almaty.

Russia also stood by Belarusian President Alexander Lukashenko in the wake of massive protests against his re-election in 2020 that were violently crushed.

In most cases, Russia is pushed by its fears that the former Soviet republics may drift towards the influence of the Western alliance, known as the North Atlantic Treaty Organization (NATO).

It was also the same story with Ukraine. The two neighbors remained aligned after the breakup of the Soviet Union in 1991, but began drifting apart in the 2000s as Kyiv sought deeper integration with Europe.

After months of deadly protests in 2014, Ukraine's pro-Russian government was toppled, which culminated in Moscow's annexation of Ukraine's Crimean Peninsula and its support for the separatist insurgency in eastern Ukraine, a war that has rumbled on ever since despite a series of shaky ceasefires, costing thousands of lives.

The current standoff centers on Moscow's demands from NATO to deny membership to Ukraine and other ex-Soviet countries and to roll back on its military deployments in Central and Eastern Europe. The demands, which have been largely rejected by Washington and the military alliance, would significantly redraw Europe's security landscape. NATO Secretary-General Jens Stoltenberg stressed that Western allies stood united in their warning to Moscow that an attack on Ukraine will provoke a severe response.

Biden has recently said that he will move US troops to NATO allies in Eastern Europe in the "near term," marking a new phase in the US response to Russia's escalation on the Ukrainian border.

As many as 8,500 US troops have already been placed on heightened alert to prepare to deploy to Eastern Europe -- including units with "medical support, aviation support, logistical support" and "combat formation," according to a Pentagon spokesman.

Washington has also called on all its allies to come up with economic sanctions to punish Russia if it goes ahead with the invasion. The European Union has already threatened "massive" sanctions and U.S. Senate Democrats have unveiled a bill to potentially punish Russian officials, military leaders, and banking institutions.

The US and UK have threatened to include personal measures targeting Russia President Vladimir Putin himself if Russia attacks Ukraine.

Western powers also think of cutting Russia out of the SWIFT financial system, which would hinder Russia's ability to send and receive money from abroad through SWIFT, which moves money from bank to bank.

Another step that could damage Russia's economy is the US plan to obstruct Russia's access to US dollars – the global reserve currency that dominates international transactions.

THE ENERGY DILEMMA

German Chancellor Olaf Scholz had also hinted at including Nord Stream 2 in a potential sanctions package, stating that Germany would discuss halting the pipeline as part of "severe economic costs".

The $11bn pipeline is currently awaiting approval from Germany and the E.U. On several occasions, Putin had hinted that could help quickly reduce soaring European energy prices. However, Nord Stream 2 critics warn that it will increase Russia's leverage over Europe and deprive Ukraine of transit revenues.

Still, energy supplies from Russia to Europe stand as one of Russia's points of strength which makes it difficult for western allies to reach a consensus over the proposed sanctions.

In the meantime, Scholz has urged Europe and the US to think carefully when considering sanctions against Russia, stressing that "we have to consider the consequences this will have for us."

The escalating tension between Russia and the West has heightened concerns about the future of Russian gas flows to the EU, which pushed the US to look at ways to secure energy for its European allies in case Moscow slashes its oil and gas exports.

Media reports indicated that the US is engaged in discussions with major natural gas producers around the globe, to understand their ability to temporarily surge natural gas supply and to allocate these volumes to European buyers.

FINDING A WAY OUT

However, experts warn that Russia, the world's third-largest producer of oil and the second-largest producer of natural gas, can create a big hole in supplies to Europe which will be difficult to compensate. Russia supplies about one-third of European natural gas consumption and more than one-quarter of its crude oil imports to become the bloc's largest single energy source.

Experts also warn Ukraine standoff can pose a major risk for the world oil market, which is already trading at a seven-year high due to strong demand which is faced off with supply troubles and waning inventories. Any disruption in oil and gas supplies could have devastating consequences on energy consumers around the globe.

As the war frenzy expands, Ukrainian President Volodymyr Zelenskyy urges the West not to panic and warned that the way the West and the media were playing up its conflict with Russia would "cost Ukrainians dearly". He even accused Biden of making a "mistake" with his strong rhetoric. There are also experts who think that the markets' reaction to the threat of the invasion suggests it may be too much for Russia's economy to bear the consequences of such a move.

GREEN ENERGY: A RELIABLE ALTERNATIVE TO OUR ENERGY NEEDS?

BY MOHSEN AHMED FARHAN ALI - DRILLING DEPARTMENT HEAD - GENERAL PETROLEUM COMPANY (GPC) - KUWAIT OIL COMPANY (KOC) CONSULTANT

The use of traditional energy sources awaits new restrictions through environmental legislation to reduce carbon emissions and mitigate climate change.

During the last few years, there has been a significant increase in environmental pollution, especially air pollution due to heat emissions resulting from conventional hydrocarbon fuel usage. This will lead to an increase in global temperatures, which will prove catastrophic in many areas worldwide and cause rising sea levels due to the melting of the polar icecaps. Therefore, the UN Climate Change Conference paid great attention to the issue, studying the specific causes of global warming. Most studies pointed to hydrocarbon fuel combustion as the main factor behind carbon emissions and global warming.

Consequently, the final recommendations came to reduce the consumption of those types of hydrocarbon fuels that have a negative impact on the environment or to search for alternative energy sources that are more environmentally responsible.

The scientists have developed new types and sources of energy, studying their feasibility, challenges, and economic potential to be a good, safe, and cost-effective alternative for traditional energy sources. As a result, new concepts and terms came about to describe these new innovative energy sources like "clean energy", "green energy", and "renewable energy".

Clean energy, such as solar energy and wind energy, is that which strictly comes from renewable, zero emission sources and does not cause atmospheric pollution when used. It also serves to conserve energy through efficiency measures. While clean energy resources also preserve the world's natural resources, they also prevent environmental catastrophes, such as natural gas leaks or fuel spills. As a matter of fact, clean energy is useful for a variety of different applications, such as the generation of electricity.

The future of green energy looks bright, with recent years showing more prominence to clean renewable energy capacity on a global scale than new hydrocarbon fuel and nuclear capacity combined. Now, more than one-third of globally installed power capacity comes from renewable sources. As the world population continues to grow, there is an ever-increasing demand for energy and unsustainable energy sources will not be sufficient to meet future energy needs. Therefore, renewable energy sources are the answer to providing sustainable energy solutions, while also protecting the planet from climate change.

Green energy is generated from natural resources, such as sunlight, wind or water. It is often produced from renewable energy sources. The key item with these energy resources is that they do not affect the environment negatively by releasing greenhouse gases or harmful emissions into the atmosphere. Usually, green energy sources are naturally renewed, as opposed to fossil/hydrocarbon fuel sources like oil/gas or coal, which may need millions of years to generate again. Green sources also often do not need high-risk mining or drilling operations, which could have significant environmental consequences. Green energy is mainly generated from renewable energy resources in a variety of different ways, whether through solar energy using solar cells or using wind turbines to generate energy.

The six most common sources of clean energy are: (1) Solar energy which is a common renewable source for green energy source produced using photovoltaic cells that capture sunlight and convert it into electricity. (2) Hydropower (hydroelectric power) uses the flow of water in rivers, streams, or dams to produce energy, including tidal energy. (3) Wind energy uses the power of the flow of air or wind speed to push turbines that then generate electricity. (4) Geothermal Energy uses thermal energy under the earth's crust but the disadvantage is that it requires drilling deep into the crust which could entail severe environmental consequences. (5) Biomass energy is the use of any extra biomass for energy generation, including wood waste, sawdust, and combustible organic agricultural waste. (6) Biofuels energy involves the conversion of organic materials into fuel, such as ethanol and biodiesel through biochemical processing.

This classification may change as green energy production technologies continue to evolve. These green energy sources are the effective alternative and direct reverse of the depleted hydrocarbon fuels that have powered us for over a century but with high heat and carbon emission. Generating clean energy with zero-carbon emissions is a great vision for a more environmentally friendly future.

Green energy benefits the environment as it replaces the negative impact of hydrocarbon fuel with more environmentally responsible alternatives that come from cleaner sources. Green energy does not involve harmful emissions and is often readily available. It can also maintain the stability of energy prices as it is all about generating energy from the local environment and, therefore, it has immunity from geopolitical crises or global oil market fluctuations. Green energy projects have economic benefits which include job creation especially when the proper infrastructure is being built. Generally, more than 10 million jobs have been created worldwide in this industry in 2018, with expectations that it will grow as green energy projects expand.

Moreover, green energy represents a low-cost source for the energy needs of many areas around the world. Its applicability will be enhanced as costs continue to go down, further increasing the viability of green energy, especially in developing countries. Green energy has the capacity and possibility to replace fossil or hydrocarbon fuels in the future; however, it may require producing from several sources by different means to achieve that. Evaluating the economic feasibility of green energy requires an exhaustive comparison with traditional hydrocarbon fuels. With the depletion of hydrocarbon/fossil fuel resources, energy costs will increase as supply goes down and scarcity increases. The efficiency of green energy may depend on the location of the project, as some areas have stronger wind currents or a better environment for solar energy.

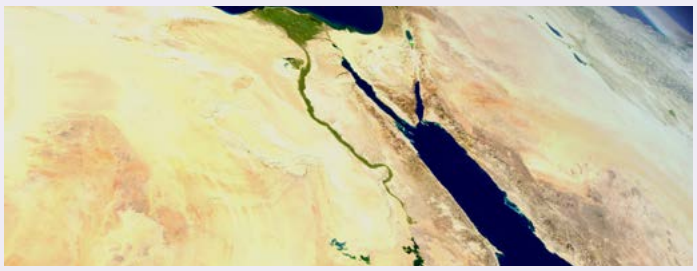
New legislations have been developed for environmental protection and to support green energy projects and on the other side, encourage the reduction of hydrocarbon fuel consumption to cut carbon emissions. Currently, some countries do not deal with nuclear energy as a clean energy source because of the serious risks associated with it. The 2011 earthquake in Japan, for example, led to a serious nuclear radiation leakage.

The fact is that fossil fuels need to become old-fashioned, as they do not provide a sustainable solution to our energy needs. By developing several green energy solutions, we can find a good sustainable future for our energy supply, without damaging the planet we all live on.

Clean energy appears to be the future for humanity's energy needs worldwide as dependence on fossil/hydrocarbon fuels goes down. As directing towards clean, green, and renewable energy continues to increase, the cost will fall and several projects will be set-up to develop these new power plants.

Every day people around the world are realizing the environmental, economic, and developmental benefits of clean energy. Many countries are joining the effort to create a greener world and with dedication, this will continue to advance.

THE VALUE OF SUBSURFACE MAPPING IN PETROLEUM EXPLORATION



One of the main activities in the daily life of geoscientists is subsurface geological mapping. Mapping and studying petroleum systems in a basin is a significant step for exploration.

Geologists, geophysicists, and engineers predict the possibility of finding oil and gas using certain methods. It helps them focus on a specific part of a province that will most likely contain petroleum accumulations. Using the right maps is a key step for reaching these goals.

For instance, the regional mapping of the basin defines the rift margins and shows the depth to the basement and structures in an area of interest. In order to attain the right maps for a certain district, it is important to have sufficient geophysical and drilling data covering the basin. Subsurface geological maps are the most important and widely used tools to explore and develop hydrocarbon reserves as well.

During the past two decades, the petroleum industry has experienced many updates in equipment and methodologies; new technologies have emerged requiring new skills. Today, the scope of subsurface mapping goes well beyond the original goal to map with spa¬tial accuracy, and it now includes many technologies that, when used together, yield insight to both predictive relationships and geological history.

The importance of understanding rift geometries, through the precise definition of rift architecture, tectonostratigraphy, and basin history, originates from its control on the development of hydrocarbon. For example, if we have a look at the mapping history of Upper Egypt's basins, the first subsurface exploration work in Upper Egypt was started by Repsol Company in 1993 to test the petroleum potential of these basins.

Modern technology provides both speed and efficiency in most aspects of exploration and development. However, problems have developed with computer-based activities because computers, not the interpreters, are driving interpretations and maps, with acceptance of the results as it is without Q.C. This practice results in maps that disturb geo¬logical principles, and hence do not reflect the geological complexity of the subsurface.

Recently published maps of Upper Egypt's rift were mainly based on the interpretation of one or two seismic surveys of different vintages that were restricted either to the east or west of the Nile River, considering that the rift margins are confined to the 2D seismic surveys boundary. For example, some authors outlined that the Komombo sub-basin is limited to the western bank of the Nile River. Consequently, these approaches missed the precise definition of the basin margins and rift border faults.

Proper analysis of the structural geometry and architecture of this large-scale rift should be based on the interpretation of all available seismic data packages, borehole data, and surface geology. This rift extends in the NW-SE direction for about 260 km with a width range of 80 to 100 km and is flanked from both east and west of the Red Sea hills and Sin El Kaddab plateau respectively. The right mapping of this rift is essential to identify the structural geometry and architecture of the sub-basins and their impact on petroleum potential. The first discovery in the area was achieved by Centurion Petroleum Company after achieving a deep understanding of the subsurface geology through accurate reservoir mapping.

AHMAD MOSTAFA

Exploration Department Head
South Valley Egyptian Petroleum Holding Company (GANOPE)

RESTRUCTURING EGYPT'S PETROLEUM SECTOR

The plan to restructure the petroleum sector aims to bring about sustainable development and change in the various activities of the petroleum sector, in order to increase its contribution to sustainable development in Egypt by helping it work more efficiently, attracting more investments, developing human cadres, and improving training. Executive procedures to implement the new organizational structure have started at the beginning of this year.

Hence, Minister of Petroleum and Mineral Resources Tarek El Molla has ensured that the necessary measures had been taken to develop and modernize the petroleum sector in three phases. The first phase includes a diagnostic study and that was from June to October 2016. As for the second phase, it included detailed plans and the start of implementation from May 2017 to December 2019. The third phase includes the implementation phase from January 2020 to June 2021.

The step of modernizing and developing the petroleum sector came within the framework of enhancing the petroleum sector's ability to keep pace with modernity and local, regional, and global changes. In 2016, the petroleum sector began implementing an ambitious program to develop and modernize the petroleum sector by contracting with specialized international entities, with the aim of bringing about sustainable development in Egypt, through enhancing efficiency, attracting more investments, developing human potential, and setting an ambitious mission and vision for the sector's future in the coming years.

The vision of the petroleum sector aims to achieve the optimum economic benefit from all capabilities and natural resources, to contribute to sustainable development in Egypt, to transform Egypt into a regional center for the oil and gas trade, and for the petroleum sector to become a model for the rest of the state's sectors in modernization and development, according to the assurances of El Molla.

The structural reform program aims to review and develop the sector's current organizational structure, separate policy development from the organizational and executive roles, eliminate the duplication of roles and overlapping competencies between different entities, while simplifying the structure and improving governance systems and standards.

Hence, El Molla's affirmations on the main axes of the restructuring plan are represented in reviewing and defining the various roles and responsibilities, separating the roles of policy-making and the organizational and executive roles at the sector level, applying best practices of governance, and setting a new organizational structure for the sector to exploit and manage the sector's resources in an optimal way.

With regard to the most important challenges to the current organizational structure that have a negative impact on the effectiveness of the sector's performance, the minister affirmed that a plan has been drawn up to manage the transitional phase, starting with the announcement of a new structure inside and outside of the sector, which will be applied by contracting with a specialized consultant.

The petroleum sector development and modernization project contribute to improving the decision-making process and developing the performance of various entities and companies affiliated with the sector, which leads to raising its performance efficiency, developing its resource management system, increasing the added value of products, increasing investments, raising production rates, and reducing costs.

MOHAMED ABDELRAOUF

Production General Manager
Qarun Petroleum Company

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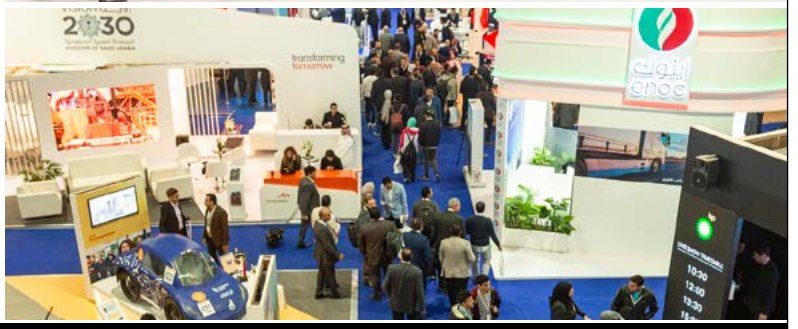

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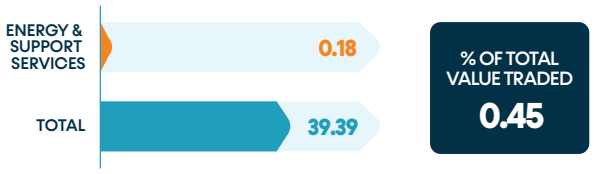
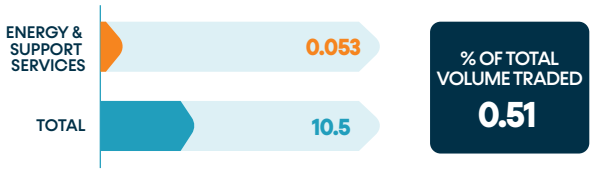
Value and Volume of Shares Traded for Energy & Support Services Sector in Dec 2021

VALUE TRADED (EGP BILLION)



VOLUME TRADED (BILLION SHARES)



Performance of Petroleum Companies in the Egyptian Exchange in Dec 2021

NATIONAL DRILLING

CURRENCY	CLOSE PRICE	YTD PRICE CHANGE (%)
USD	4.69	-

ALEXANDRIA MINERAL OILS CO.

CURRENCY	CLOSE PRICE	YTD PRICE CHANGE (%)
EGP	3.66	▲ 17.31

EGYPT GAS

CURRENCY	CLOSE PRICE	YTD PRICE CHANGE (%)
EGP	36.09	▼ 17.17

SIDI KERIR PETROCHEMICALS

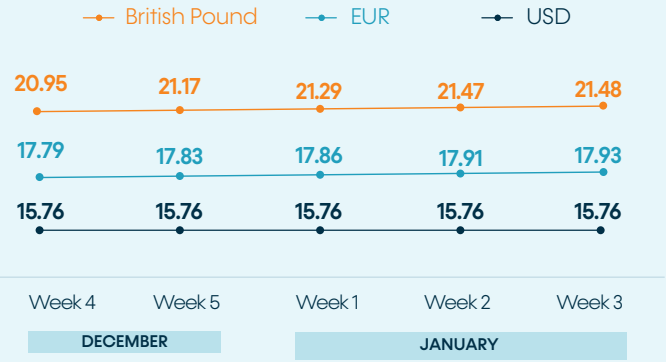
CURRENCY	CLOSE PRICE	YTD PRICE CHANGE (%)
EGP	7.8	▼ 16.22

Source of Raw Data: CBE, CAPMAS, Egyptian Exchange, IHS Markit

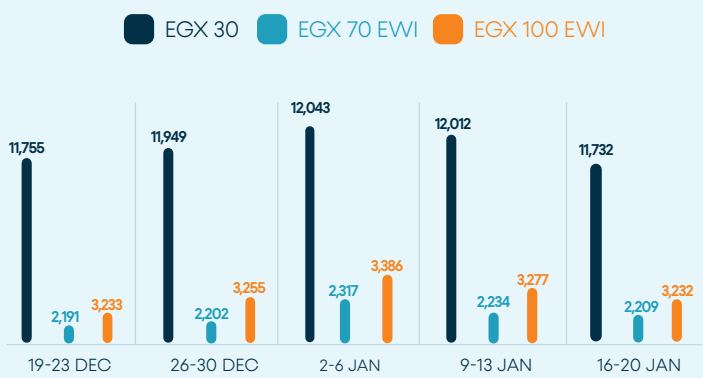
MAIN ECONOMIC INDICATORS

	November 2021	December 2021
ANNUAL INFLATION HEADLINE CPI (%)	5.6	5.9
NET INTERNATIONAL RESERVES ($ BILLION)	40.91	40.94
NON-OIL PRIVATE SECTOR PMI (POINTS)	48.7	49

EXCHANGE RATES



CAPITAL MARKET INDICATORS

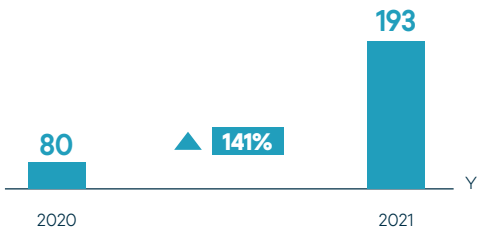


EUG BID ROUND AWARDED BLOCKS

Awarded Blocks	Awarded Companies	Area (km²)	Location
EGY-MED-E5	Eni, BP	3,203	Mediterranean Sea
EGY-MED-E6	Eni	2,983	
EGY-WD-7	Eni, Apex	514.8	Western Desert
EGY-WD-8	Energean Egypt INA Nafte	1,612.4	
EGY-WD-9	Eni	732.2	
EGY-WD-11	United Energy	1,400.6	
EGY-GOS-13	Eni	954.7	Gulf of Suez
EGY-GOS-14	Enap Sipetrol	907.9	

DANA GAS RECEIVABLES FROM EGYPT ($ million)

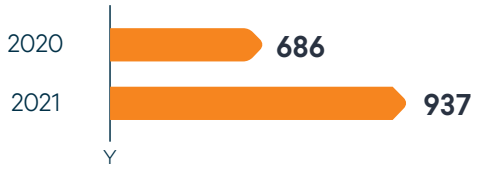
Remaining Receivables
less than **$30** million



EGYPT TO EXPORT NATURAL GAS TO LEBANON

Amount	Expected Date	Through
60-65 mmcf/d	Q1 2022	The Arab Gas Pipeline

LNG CARGOES CROSSING IN SUEZ CANAL



Growth Rate
36.6% ↑

Investments to Develop Public Petroleum Companies in FY 2022/23

EGP **30** billion

STRATEGIC PETROLEUM PROJECTS IN SUEZ

THE NEW ASPHALT PROJECT

ESTABLISHING **3** ASPHALT STORAGE UNITS PROJECT

Storage Capacity	Asphalt Shipping Platform Cost
9,000 m³	EGP 139 million

MODERNIZING OLD WAX DISTILLATION WAREHOUSES PROJECT

No. of Units **3** Capacity **7,500** m³

OTHER PROJECTS

	Investment Cost (EGP billion)
Establishing Coking & Diesel Production Complex	28.6
Installing Salt Separators for Distillation Units	0.6

INTERNATIONAL OIL PRICES

	BRENT PRICES ($/BBL)	OPEC BASKET PRICES ($/BBL)	NATURAL GAS PRICES ($/MMBTU)
9 November	84.78	82.70	4.98
30 November	70.57	71.01	4.57
7 December	75.44	74.65	3.71
17 December	73.52	74.23	3.69
3 January	78.98	78.02	3.82
19 January	88.44	88.50	4.03

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