

EGYPT'S PETROLEUM SECTOR
**A JOURNEY OF
SUCCESS**



EGYPT'S PETROLEUM SECTOR: A JOURNEY OF SUCCESS



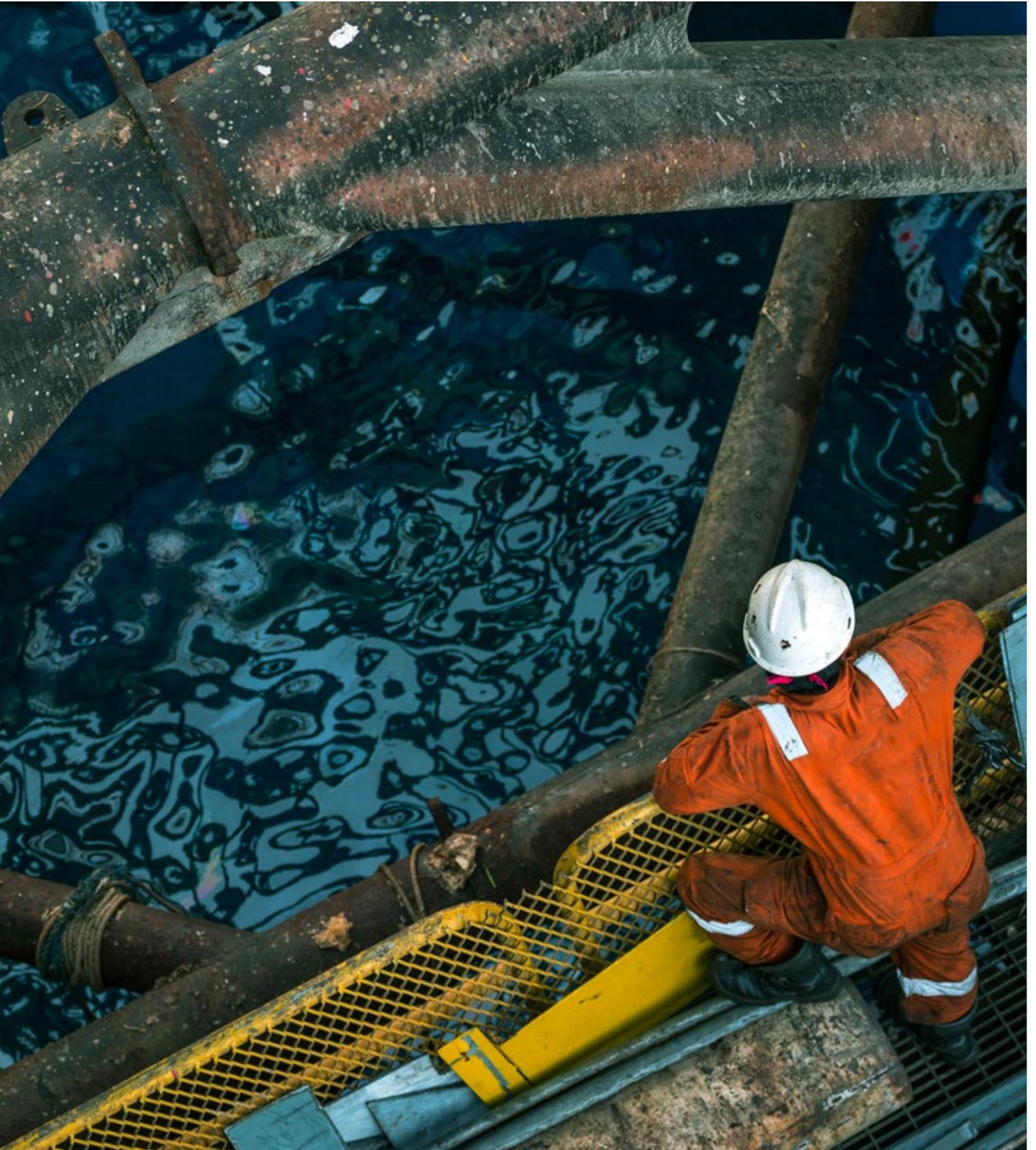
ABOUT THIS REPORT

After years of instability, the Ministry of Petroleum and Mineral Resources was able to break barriers and achieve unprecedented results in the upstream, midstream and downstream activities over FYs (2014/15-2018/19). With this regard, the Modernization project, accompanied by other success factors, was the ministry's main strategy to hit its targets. One of these targets is the process of transforming Egypt into a regional natural gas hub. Egypt Oil & Gas Research & Analysis also shed the light on the petroleum sector's economic contribution during the referred period. This comprehensive report endows the sector's stakeholders with the opportunity to go through the sector's journey of success over the referred period.



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LIST OF ABBREVIATIONS

AEE	Association of Energy Engineers
ANRPC	Alexandria National Refine and Petrochemical Company
APC	Alexandria Petroleum Company
ASORC	Assiut Oil Refining Company
BBL/D	Barrel per day
BCF	Billion cubic feet
BCF/D	Billion cubic feet per day
CNG	Compressed Natural Gas
CoW	Control of Work
DSS	Decision Support System
E&P	Exploration and Production
EBRD	The European Bank for Reconstruction and Development
EC	European Commission
ECHEM	Egyptian Petrochemicals Holding Company
EECD	Energy Efficiency and Climate Division
E-FGMP	Egypt-Flare Gases Monetization Program
EGAS	Egyptian Natural Gas Holding Company
EGPC	Egyptian General Petroleum Corporation
EPEEC	Egyptian Petroleum Sector Energy Efficiency Conference
ERC	The Egyptian Refining Company
ERP	Enterprise Resources Planning
ESHPETCO	Esh El Mallaha Petroleum Company
EU	European Union
EUG	Egypt's Upstream Gateway
FDI	Foreign Direct Investments
FSRU	Floating Storage and Regasification Units

FY	Fiscal Year
GAFI	General Authority for Investment
GAOPE	Ganoub El Wadi Petroleum Company
GASCO	The Egyptian Natural Gas Company
GDP	Gross Domestic Product
GMRA	Gas Market Regulatory Authority
HSE	Health, Safety and Environment
ICT	Information and Communication
IOCs	International Oil Companies
IoT	Internet of Things
JICA	Japan International Cooperation Agency
KM ²	Kilometer Square
LDC	local Distribution Company
LNG	Liquefied Natural Gas
MDF	Medium-Density Fiberboard
MIDOR	Middle East Oil Refinery
MMBBL	Million barrel
MMCF/D	Million cubic feet per day
MMT	Million Tons
MMT/Y	Million Tons per year
MMTOE	Million Tons of Oil Equivalent
MoP	Ministry of Petroleum and Mineral Resources
MOPCO	Misr Fertilizers Production Company
MoUs	Memoranda of Understanding
MPMAR	Ministry of Planning and Economic Development
MW/Y	Megawatt per year



NMP	N methyl pyrrolidone
NOCs	National Oil Companies
OSHA	Occupational Safety and Health Administration
PCM	Process Safety Management
PhPC	Pharaonic Petroleum Company
PO	Process Orchestration
RECREEE	The Regional Center for Renewable Energy and Energy Efficiency
RFIs	Requests for Information
SAP	Systems Applications and Products in Data Processing
SDT	Strategy Deployment Team
SEGAS	The Spanish Egyptian Gas Company
SIDPEC	Sidi Kerir Petrochemicals Company
SNF	Sulfonated naphthalene formaldehyde
SOPC	El Nasr refinery at Suez Oil Processing Company
SUMED	The Arab Petroleum Pipeline Company
T/Y	Tons per year
TCF	Trillion Cubic Feet
UNIDO	United Nations Industrial Development Organization
VAT	Value-Added Tax
WDDM	West Delta Deep Marine
WND	West Nile Delta







SECTION ONE
SECTOR'S STRATEGY,
REFORMS &
DEVELOPMENTS



THE ROLE OF POLITICAL LEADERSHIP IN PROMOTING THE PETROLEUM SECTOR

Political leaders have been keen to keep Egypt as a regional and international pioneering country and to continue to meet Egypt's generations' needs over the past four Fiscal Years (FY) between FY 2014/15 and FY 2018/19. Therefore, creating a roadmap is essential to maximize the benefits from its resources so as to achieve future goals.

Accordingly, the government adopted a series of economic reforms through different acts such as reforming energy subsidy systems to ensure the sustainability of energy supply, floating the Egyptian pound and developing investment

legislations to increase the competitiveness of Egypt's national economy.

Within this framework, the petroleum sector has adopted a different methodology that targets sustainability through new policies, strategies, and vision. Additionally, this methodology seeks securing the country's energy supplies as well as overcoming the chronic challenges that affect the citizens' welfare.

THE ROLE OF ECONOMIC REFORM IN SUPPORTING THE PETROLEUM SECTOR

A. EGYPTIAN INVESTMENT CLIMATE OVERVIEW

Within the support of the political leadership, the Egyptian petroleum sector has created an economic model to promote investment. The Ministry of Petroleum and Mineral Resources (MoP) depended on attracting investments as well as transferring technology and increasing job opportunities. This economic model depends on four axes; these axes are: attracting investments, establishing petroleum profitable

projects in both foreign and local currencies, creating new direct and indirect job opportunities, and exporting high quality petroleum, petrochemical products and natural gas.

Concerning the legal framework, the Egyptian government has been working on improving laws and facilitating regulations to attract international, regional and domestic investments since the 1990s.



B. THE NEW INVESTMENT LAW

In 2015, Egypt's former Ministry of Investment and International Cooperation drafted a new investment law before the launch of the economic reforms. On the 1st June 2017, the long-awaited Investment Law, No. 72 of 2017, was approved. The new law reflects the efforts made by the Egyptian government and legislative authorities to avoid any misreading of local or foreign investors' needs. It is designed to make processes easier for investors and businesses.

The law helped Egypt to succeed in adopting the single window system at the General Authority for Investment (GAFI), providing mechanisms to support investors protection. Moreover, the law helps in promoting competitiveness, governance and transparency.



SECTOR'S STRATEGY, REFORMS & DEVELOPMENTS

C. ECONOMIC AND SUBSIDIES REFORMS

The Egyptian government applied several fiscal and monetary policy reforms. The reforms included fuel and electricity subsidies that were cut in budget by almost 3% of Gross Domestic Product (GDP).

The energy subsidies amounted to EGP 139.5 billion, of which EGP 126.2 billion was spent on fuel subsidies. Accordingly, the government launched the energy reform program and plan to remove the electricity subsidies by FY 2020/21.

A second reduction took place in June 2017 and the government announced, in June 2018, a third round of fuel subsidy cuts.

As a result, fuel Subsidies dropped by 19.1 % to reach EGP 89.1 million in FY 2018/19, compared to EGP 110.1 million in FY 2017/18, as shown by the Ministry of Finance data.



Fuel Subsidy Reform

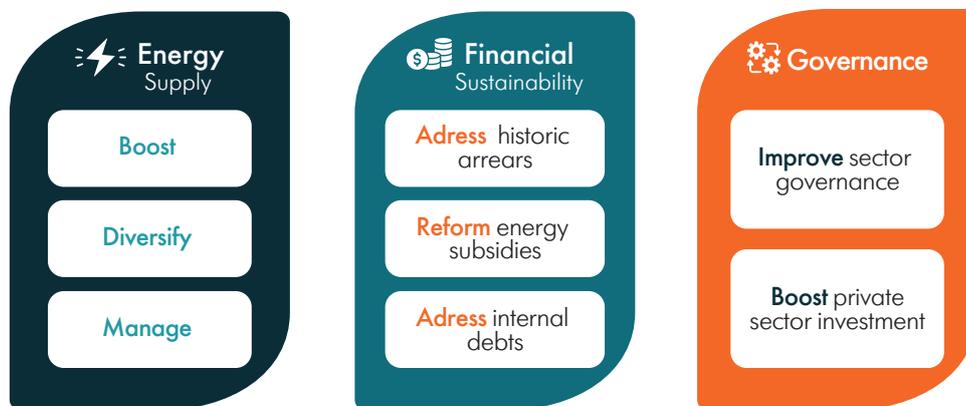
- 
Launched
Jul. 2014
- 
1st Round of Subsidy Cuts
Nov. 2016
- 
2nd Round of Subsidy Cuts
Jun. 2017
- 
3rd Round of Subsidy Cuts
Jun. 2018

THE ROLE OF MODERNIZATION PROJECT AND MINISTRY'S STRATEGY IN DEVELOPING THE PETROLEUM SECTOR

The Egyptian petroleum sector is mainly based on three strategic pillars: energy security, financial sustainability and governance.



Oil and Gas Strategic Plan



The MoP has launched a four year project that started in 2016 to modernize and improve the petroleum sector through a comprehensive strategy to achieve sustainability within the sector. The project's vision aims at achieving financial

sustainability, transforming Egypt into a regional oil and gas hub. The modernization project maintains a group of core values including innovation, efficiency, ethics, transparency and safety. The project is composed of three main phases.



Modernization Project Phases





SECTOR'S STRATEGY, REFORMS & DEVELOPMENTS

B. MODERNIZATION PROJECT PILLARS

The modernization project embraces seven pillars which focus on developing an attractive environment for foreign investment, reducing bid round cycles, improving evaluation efficiency, improving business practices in Egypt's oil and gas sector through setting the roles of policy making, and operational responsibilities to be assigned to independent entities.

The modernization project is significant for the oil and gas sector, as it delivers some important benefits to the sector.

These benefits are concerned with enhancing the country's GDP, contributing to economic growth, decreasing budget deficit and increasing foreign currency inflows, reducing import bill, and finally securing sustainable supplies of energy sources.



Modernization Project Pillars



THE IMPACT OF DEVELOPMENTS IN THE PETROLEUM SECTOR ON THE EGYPTIAN ECONOMY

A. THE PETROLEUM SECTOR'S CONTRIBUTION TO GDP

Although the sector's contribution to GDP witnessed a negative growth rate between FYs 2014/15 and 2016/17, the rate significantly increased by 52.1% and 46.6% in FY 2016/17 and FY 2017/18, respectively, according to the Ministry of Planning and Economic Development (MPMAR).

As a result, crude oil's growth rate increased by 44.1% between FYs 2014/15 and 2017/18, while natural gas' growth rate increased by 55.7% during the same period.

Crude oil share in GDP witnessed an increase of 9.3% between FYs 2016/17 and 2017/18, according to the MPMAR.

Natural gas recorded a better performance in FY 2017/18 compared to crude oil, as in FY 2017/18 it contributed to the GDP by 5.19%. The natural gas share witnessed an increase of 27.5% in FY 2017/18 compared to the previous year.

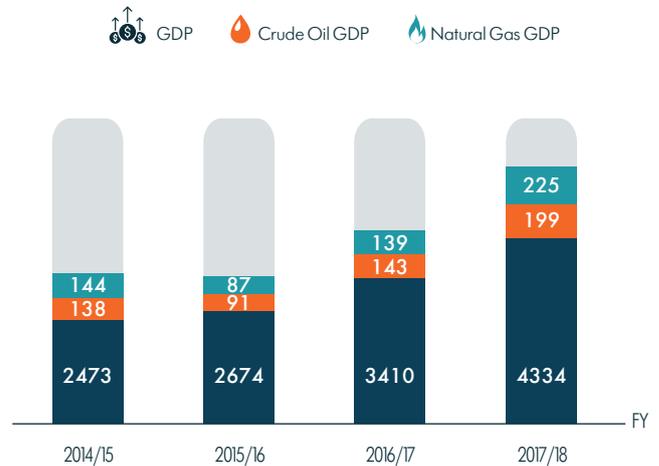
It is worth noting that the highest natural gas shares in GDP were recorded in FY 2014/15, representing 5.84% of GDP. However, during the following year, FY 2015/16, natural gas shares in GDP were at its lowest level; nearly 3.25%, according to the MPMAR.

B. THE PETROLEUM SECTOR'S FOREIGN AND PUBLIC INVESTMENTS

Post FY 2016/17, the petroleum investments followed an increasing trend. In FY 2017/18, the petroleum investments significantly jumped by 27% in comparison to FY 2016/17.

In FY 2018/19, the petroleum investments rose by 10.5% to reach its peak at EGP 172.4 billion.

Petroleum Sector's Contribution to GDP over FYs (2014/15-2017/18) (EGP Billion)



Petroleum Foreign and Public Investments over FYs (2014/15-2018/19) (EGP Billion)

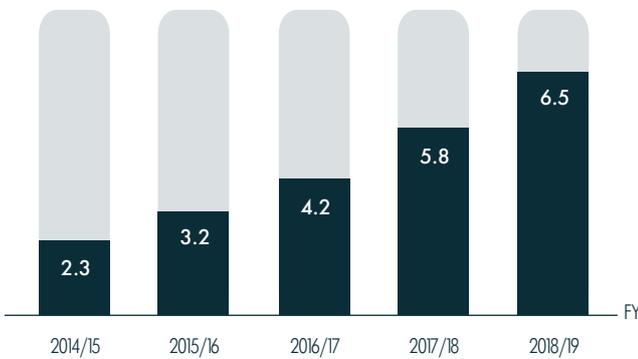


SECTOR'S STRATEGY, REFORMS & DEVELOPMENTS

Petroleum public investments have been increasing over time. In fact, public investments reached EGP 2.3 billion and EGP 6.5 billion in FY 2014/15 and FY 2018/19; creating an increase of 183% during the mentioned period, according to the MoP.



Petroleum Public Investments over FYs (2014/15-2018/19) (EGP Billion)

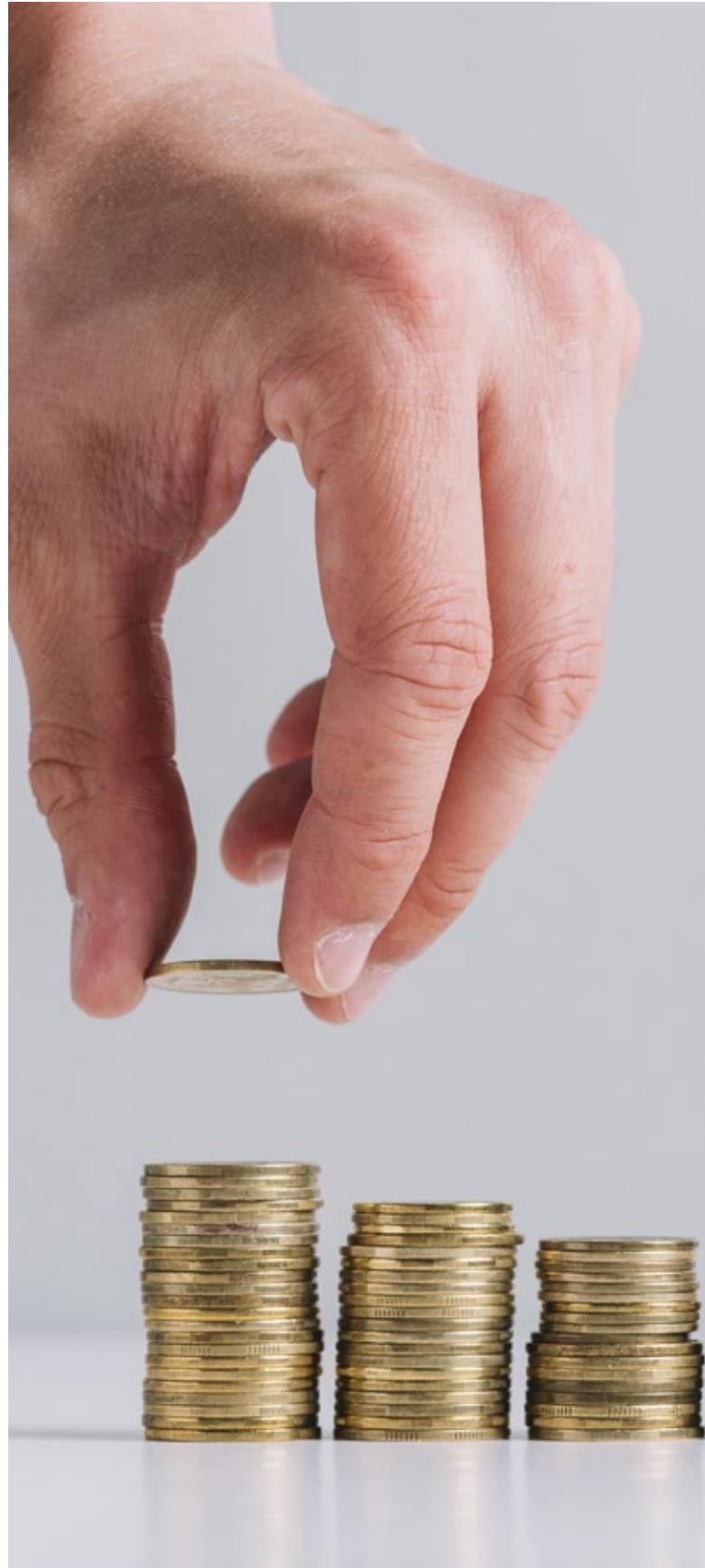
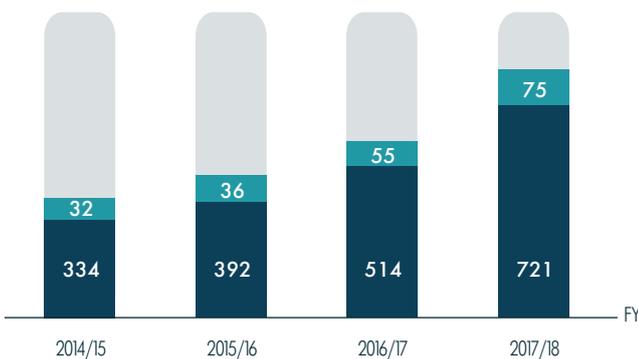


On the basis of the giant discovery of Zohr, Egypt became an attractive place for investing in natural gas. Therefore, natural gas investments increased by 13.29% in FY 2015/16. The highest natural gas share was recorded 10.74% of total investments in FY 2016/17. Natural gas investments rose from EGP 75 billion in FY 2017/18 to EGP 55.2 billion in FY 2016/17, according to the MPMAR.



Total Natural Gas Investments over FYs (2014/15-2017/18) (EGP Billion)

 Total Investments  Petroleum Investments



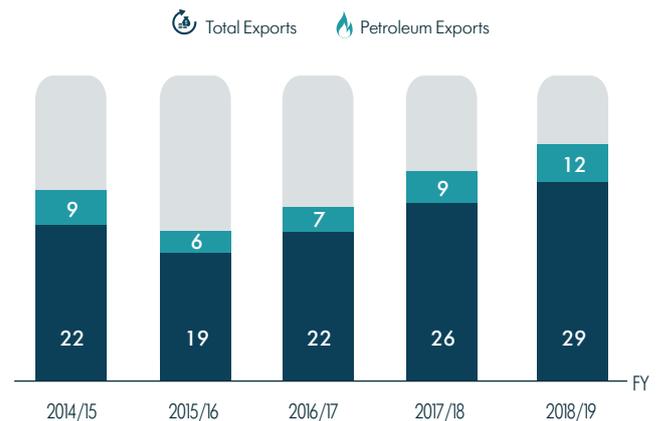
C. PETROLEUM EXPORTS

The petroleum exports reached its maximum contribution in total exports in FY 2018/19, which is 41.33%. The petroleum exports, as part of the merchandize exports, rose by 34.55% to reach \$8.92 billion (equivalent to EGP 142.16 billion at average exchange rate in January 2020) in FY 2017/18 compared to \$6.6 billion (equivalent to EGP 105.18 billion) in the previous year.

Petroleum exports represented approximately 35.45% of the total merchandise exports. While the lowest contribution of petroleum exports recorded 31.02% of total exports in FY 2015/16, according to the MPMAR.



Petroleum Exports over FYs (2014/15-2018/19) (\$ Billion)



SUCCESS FACTORS

The petroleum sector was able to achieve remarkable progress thanks to many factors. The success factors were supported by the presence of security and political stability, political leadership with vision and capabilities, strategies and action plans based on clear scientific and methodological bases. In addition, open dialogue between partners in setting decisions and identify problems as well as the presence of sincerity and dedication to work play a significant role.



Key Success Factors



Strong Implementation Structure and Well- Defined Execution Plan.



Collaboration between Youth and Expertise



Timing of the Project Copes with Egypt's Vision



Scientific and Innovative Approach



Sector- Top Leader Support



Political Support







SECTION TWO
UPSTREAM
ACTIVITIES



UPSTREAM ACTIVITIES

AGREEMENTS AND BID ROUNDS

A. PETROLEUM AGREEMENTS

Over the course of FYs 2014/15 and 2018/19, the MoP's efforts to attract more investments and to expand crude oil and natural gas exploitation activities were crowned by signing 64 petroleum agreements. Out of these agreements, 45 were new ones while 19 were amendments. The signature bonuses and minimum investments amounted to about \$250 million and \$1.6 billion, respectively, with the commitment to drilling 120 wells.

 Signed Petroleum Agreements over FYs (2014/15-2018/19)

 Total  New Agreements  Amended Agreements



B. INTERNATIONAL BID ROUNDS

Over the referred period, the MoP launched five international bid rounds. Ganoub El Wadi Petroleum Holding Company (GANOPE), Egyptian Natural Gas Holding Company (EGAS)

and Egyptian General Petroleum Corporation (EGPC) offered 20, 28 and 22 blocks, respectively, with a total of 70 blocks; 28 of which were awarded.



International Bid Rounds' Results over FYs (2014/15-2018/19)

 CONCESSIONAIRE

 AWARDED BLOCKS

 SIGNATURE BONUS (\$ million)

 MINIMUM INVESTMENTS (\$ million)

CONCESSIONAIRE	AWARDED BLOCKS	SIGNATURE BONUS (\$ million)	MINIMUM INVESTMENTS (\$ million)
GANOPE	7	66.75	323.3
EGAS	9	49.5	906.15
EGPC	12	132.6	344.5

With the economic stagnation caused by the 2011 uncertainty, the petroleum sector witnessed no signed agreements. However, in FY 2014/15, the sector strongly returned to the scene through signing 24 petroleum agreements, 18 new agreements in addition to six amendments.

Consequently, FY 2014/15 was marked as the year with the largest number of signed agreements over the referred period with a share of 38%. The signature bonus and minimum investments reached about \$215.7 million and \$10.2 billion, respectively.

In FY 2015/16, EGAS international bid round 2015 resulted in awarding of four offshore areas in Mediterranean Sea and drilling of eight wells, with signature bonus of \$10.5 million and minimum investments of \$306.15 million.

Further, in 2016/17, both EGPC and GANOPE launched two bid rounds, offering 21 blocks in the Western Desert and the Gulf of Suez. Out of these blocks, eight were awarded to different International Oil Companies (IOCs) with a signature bonus of about \$130.65 million, minimum investments of \$423 million.

In FY 2018/19, the MoP managed to sign 13 petroleum agreements, with signature bonus of \$104.5 million and

minimum investments of \$294.95 million with the commitment to drilling 41 wells. The year witnessed the highest number of awarded blocks; 11 blocks, from EGPC and EGAS bidrounds.

In addition, due to the demarcation agreement between Egypt and Saudi Arabia, the petroleum activities in the Red Sea started flourishing. The seismic survey and data collection projects were conducted in 2018 for the first Exploration and Production (E&P) international bid round in the Red Sea with investments costs reaches \$750 million by the end of the project.

Ganope launched the first bid round in the red Sea, offering 10 crude oil and natural gas exploration blocks. Out of these blocks, three were awarded, one went to Chevron, another to Shell and a third was shared jointly between Mubadala and Shell. The total exploration area covers about 10,000 km², with minimum investments of \$326 million.

The bid round came within the MoP's strategy to achieve the optimum economic use of natural gas resources potentials which contribute to the sustainable development of Egypt. The MoP also sees the results of the bid round as a notable sign at this stage which will pave the way for more investment opportunities within the region.





UPSTREAM ACTIVITIES

EXPLORATION AND PRODUCTION ACTIVITIES

The highest level of petroleum production in the country's history was recorded in 2019. The total petroleum production rate in this year reached around 1.9 million barrels of oil

equivalent per day (mmboe/d) of crude oil, natural gas and condensates and LPG.



The highest petroleum production rate recorded at **1.9 mmboe/d** in **2019**.



The highest natural gas production rate in history recorded at **7.2 bcf/d** in **2019**.

A. NATURAL GAS

I. NATURAL GAS EXPLORATION AND PRODUCTION ACTIVITIES OVER FYS (2014/15-2018/19)

a. Seismic Surveys

According to EGAS's annual reports between FYS 2014/15 and 2018/19, in FY 2014/15, 3D seismic surveys were conducted in the Mediterranean Sea over a total area of 9,700 kilometer square (km²) with a cost of \$42 million. The regional project in Mediterranean sea (SPEC) started at 2015 by reprocessing for legacy 2D data 11,000 km and 3D data 6,000 km². The total 2D seismic acquisition covered 29,283 km per two phases. The area covered by seismic surveys in FY 2015/16 increased to

13,652 km² at a cost of \$51 million. In FY 2016/17, the total area covered by seismic surveys reached 9,233 km², costing \$39.2 million.

In FY 2017/18, the seismic surveys were implemented only in the Mediterranean concessions. During FY 2018/19, 2D and 3D seismic surveys were conducted over number of concessions in both the Nile Delta and the Mediterranean.



b. Discoveries

Over the period from FYs 2014/15 to 2018/19, 86 natural gas discoveries have been made, offering an unprecedented insight into Egypt’s reserves. These discoveries enhanced Egypt’s available capacity and enhanced the country’s transformation into a regional natural gas hub.

During FY 2014/15, 22 new gas fields were discovered in the Western Desert, the Nile Delta, and the Mediterranean, in which eleven, nine, and three were discovered, respectively. These discoveries contributed in achieving reserves of 3.6 trillion cubic feet (tcf) of natural gas and 65.2 million barrels (mmbbl) of condensates, according to EGAS Annual Report 2014/15.

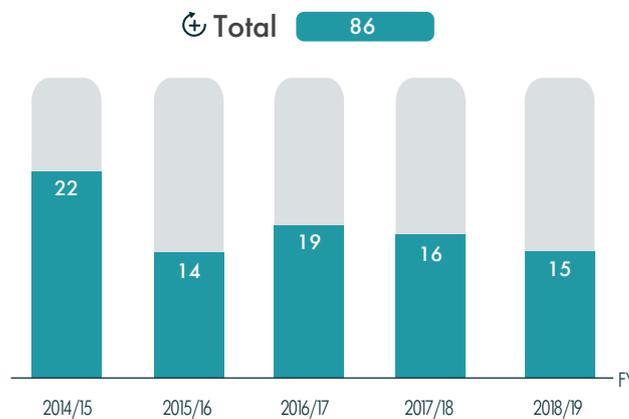
Salamat is one of the significant discoveries that contains natural gas reserves of about 1.7 tcf and condensates reserves of 23.6 mmbbl, explained in EGAS Annual Report 2014/15.

During FY 2015/16, 14 new gas discoveries were achieved in the Western Desert, the Nile Delta, the Mediterranean, and the Eastern Desert of which six, four, three and one were discovered, respectively. These discoveries significantly contributed to 22.4 tcf of natural gas and 30.35 mmbbl of condensates reserves, according to EGAS Annual Report 2015/16.

In FY 2016/17, 19 new natural gas fields were discovered, 10 of which were in the Western Desert. These new discoveries added a reserve of about 2 tcf of natural gas and 19.6 mmbbl of condensates, according to EGAS Annual Report 2016/17.

Four major discoveries in the Nile Delta and the Mediterranean added reserves of about 188.6 billion cubic feet (bcf) of natural gas and 2.9 mmbbl of condensates.

 Natural Gas Discoveries over FYs (2014/15-2018/19)





UPSTREAM ACTIVITIES

During FY 2017/18, 16 new gas discoveries were achieved; 14 in Western Desert and two in the Nile Delta. These new discoveries added reserves of about 183 bcf of natural gas, stated in EGAS Annual Report 2017/18.

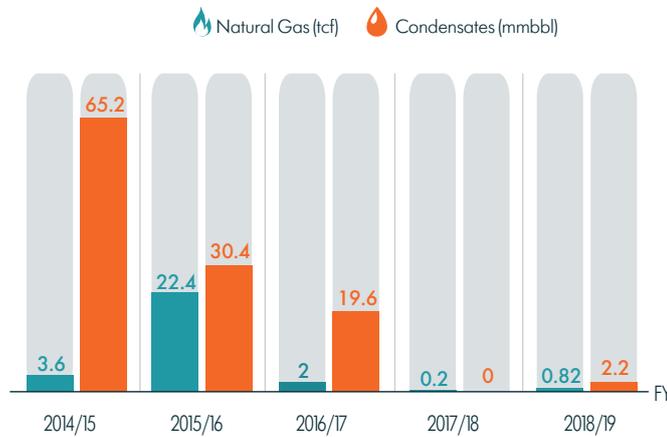
Over the previous FY 2018/19, 15 new gas discoveries were made. The total reserves of natural gas added reached 817

bcf, while the condensates reserves accounted for 2.2 mmbbl, according to EGAS Annual Report 2018/19.

Five of the total discoveries were announced to have the largest share of the added reserves of 598 bcf, explained in EGAS Annual Report 2018/19.



Reserves Added by New Discoveries Over FYs (2014/15-2018/19)



c. Main Fields/Fields Development

The exploration and development agreements signed with the IOCs facilitated the fast start of the production from Zohr, West Nile Delta (WND) and Atoll fields as well as launching Burullus

9B phase, which provided a boost to Egypt's domestic natural gas production.



1. Zohr Field

In August 2015, Eni announced that it made one of the most supergiant gas discoveries in the deep waters of Egypt, in the Shorouk Block, 190 km north of Port Said. Eni holds 50% stake, while 30% belongs to Rosneft, 10% for Mubadala Petroleum and BP owns 10%.

In December 2017, Eni has produced its first natural gas from the field in a record time for this type of field of less than two

and a half years meanwhile the average worldwide from 6 to 8 years. At the end of August 2018, the development plan of Zohr achieved a production of 2 billion cubic feet (bcf/d). Since then, the field's production has been increasing, reaching 2.7 bcf/d in August 2019.

2. The West Nile Delta Project

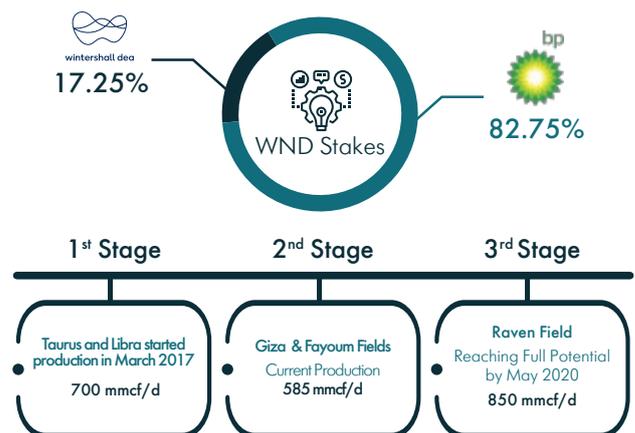
WND Project includes a total of five natural gas fields across the North Alexandria and West Mediterranean Deepwater offshore concession.

Taurus and Libra Started in March 2017 added 700 milion cubic feet per day (mmcf/d). The second stage of WND, including Giza and Fayoum fields, that embraces eight wells started in February 2019.

The third stage of the project will develop the Raven field with an expected start date April 2020.

The combined production from the three stages is expected to reach 2.3 bcf/d, representing 30% of Egypt's current natural gas production, which will be fed into the natural gas grid.

West Nile Delta Project



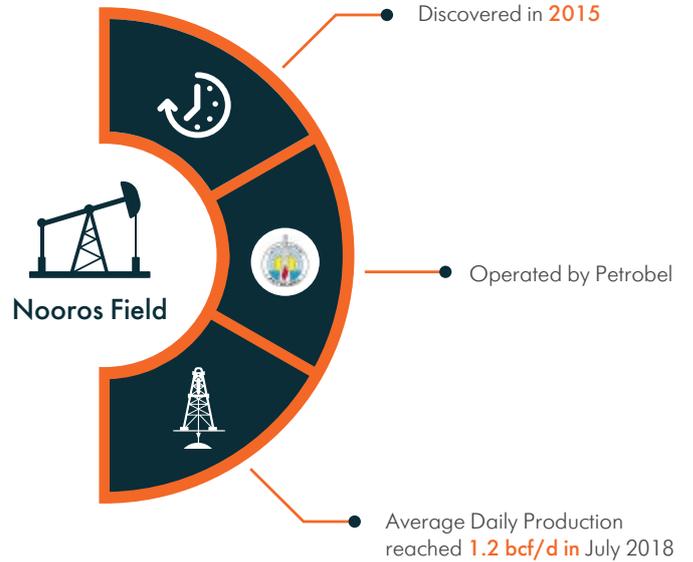


UPSTREAM ACTIVITIES

3. Nooros Field

The Nooros field, a Nile Delta offshore field, was discovered in July 2015 and is operated by Petrobel. The field commenced production in August 2015. Since then and until July 2018, fifteen wells were put on production.

In 2017, the level of production recorded the targeted production of 1 bcf/d and it continued to increase in 2018 to reach 1.2 bcf/d due to the drilling of a new successful well.



4. Atoll Field

Atoll offshore field is located in the North Damietta area and is one of the promising fields that was discovered in 2015. Currently, the Atoll development is led by BP, while operated by the Pharaonic Petroleum Company (PhPC). The field's first phase started producing 350 mmcf/d from three wells in December 2017.

The MoP is setting a plan to start production from two new wells in Atoll and Katameya fields in FY 2019/20. Consequently, Katameya field's production will reach 45 mmcf/d. Furthermore, the field's fourth well is set to be completed by Q1 2020, as explained by the financial results of the PhPC for FY 2018/19.



Atoll Field

<p>Initial Production</p> <p>Natural Gas 350 mmcf/d</p> <p>Condensates 9,000 bbl/d</p>	<p>Operating Date</p> <p>Dec. 2017</p>	<p>Location</p> <p>North Damietta Deepwater</p>	<p>Drilled Wells</p> <p>3</p>
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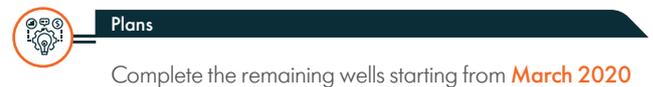
5. The West Delta Deep Marine – Burullus Phase 9B

The West Delta Deep Marine (WDDM) concession in the Mediterranean Sea embraces 19 natural gas fields, of which 12 fields are currently in production. The fields are located at water depths ranging from 700 meters to 850 meters and about 90 km to 120 km away from the shore.

The concession provides natural gas to both the domestic market and Idku Liquefied Natural Gas (LNG) plant. Among the significant expansion projects in the WDDM concession is the Burullus Phase 9B project.

Burullus Phase 9B project in the WDDM concession was developed and added to the production map in 2018. In October and November 2018, the first and the second wells were put on stream where their production recorded 40 mmscf/d. In October 2019, the third well was brought online, producing 100 mmscf/d. In November 2019, the fourth well was brought online, adding 70 mmscf/d.

Development of 9B Phase in the WDDM



d. Production Rates

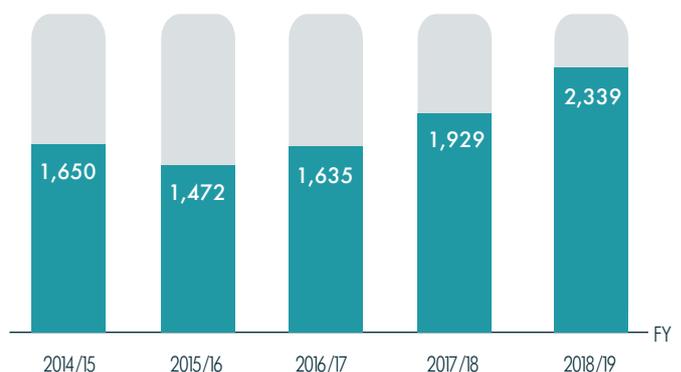
Over the referred period, the Egyptian natural gas production recorded 9025 billion standard cubic feet (bscf), producing on average more than 1800 bscf annually.

The production slightly declined between FY 2014/15 and 2015/16. However, the natural gas production has undoubtedly recovered since 2016, thanks to the government’s efforts to clear its debts and improve the terms offered to IOCs.

In addition to the development of the giant Zohr field, which was discovered in 2015. Hence, the production followed an increasing trend starting from FY 2016/17 to reach its highest level of 2339 bscf in FY 2018/19.

Natural Gas Production over FYs (2014/15-2018/19) (bscf)

Total 9,025





UPSTREAM ACTIVITIES

II. NATURAL GAS TRADE

Natural gas supply was negatively affected after production was hit by the instability in the country and investments in the upstream sector began to decline in FY 2012/13. This meant that Egypt was forced to transition from being a natural gas exporter to becoming a net importer.

a. Natural Gas Exports

The natural gas exports through pipelines sharply declined from 8.7 bcf in FY 2014/15 to zero bcf between FYs 2016/17 and 2017/18.

However, Egypt was able to resume exports to Jordan again in October 2018 after achieving self-sufficiency in September 2018. In FY 2018/19, the total amount exported of natural gas through pipelines reached 53 bcf, according to EGAS annual reports.

The discovery of the Zohr field, along with the MoP's efforts to reduce arrears to IOCs and accelerate development plans, supported Egypt's natural gas production and maintained it to reclaim its position as a natural gas exporter.

 Natural Gas Exports through Pipelines over FYs (2014/15-2018/19) (bcf)

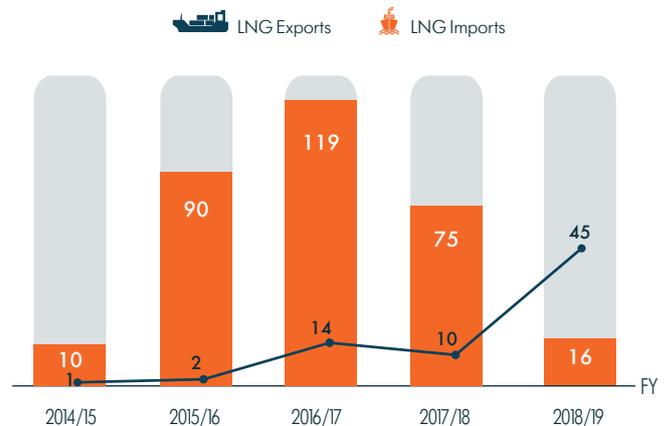


b. LNG Exports/Imports

The LNG exports increased from one cargo in FY 2014/15 to 45 cargoes in FY 2018/19. On the other hand, the LNG imports reached a maximum of 119 cargoes in FY 2016/17 and sharply declined to 16 cargoes in FY 2018/19, according to EGAS annual reports.

As Egypt succeeded in halting LNG imports in 2018, EGAS released the Floating Storage and Regasification Units (FSRU) importing facility "Hoegh Gallant" for a third party.

 LNG Exports and Imports over FYs (2014/15-2018/19) (cargoes)



c. LNG Facilities

Egypt has a relatively large, well-developed natural gas export infrastructure, which includes two world-class LNG exporting facilities.

The Spanish Egyptian Gas Company (SEGAS) and the Egyptian Liquefied Natural Gas Company (ELNG) manage the LNG facilities.

Damietta plant functions as a tolling facility. The plant is currently idle and is expected to begin exporting 500 mmcf/d of LNG, before increasing to 700 mmcf/d in 2020, according to EGAS’s website.

The Idku terminal, on the other hand, was established in 2001 when EGPC, Edison and BG signed an agreement to develop an integrated LNG export project in Egypt.

The project is a two-train LNG terminal on the Mediterranean Coast, aiming to export ELNG to Europe and the US.

Noticeably, the Idku facility resumed its operations, as Shell started to export natural gas from the offshore Burullus and Rosetta fields. In February 2019, LNG exports from Idku facility increased to 800 mmcf/d.

LNG Exporting Facilities

	 Location	 Capacity (bcf/y)	 Operating Year	 Operation Status
 SEGAS	Damietta	239.4	2005	Idle
 Idku	Idku	367.5	2005	Operating

III. NATURAL GAS MARKET LEGAL REFORMS

Prior to 2017, natural gas activities in Egypt were covered by law No. 217 of 1980. Under this law, EGAS was responsible for all operations relating to transportation and domestic supply of natural gas to different sectors.

EGAS and EGPC announced in May 2015, the decision to allow private companies to use the state-owned national gas grid to import, transfer and distribute natural gas to the local market.

The decision to liberalize natural gas market was implemented in law in July 2017, when EGAS and EGPC declared the issuance of the Gas Market Law No. 196 for 2017. At the same time, it was announced that the market would be fully liberalized by 2022.

In February 2018, the law was followed by the promulgation of the executive regulation to implement the law.

The law refers to the establishment of an independent regulatory body, called the Gas Market Regulatory Authority (GMRA).

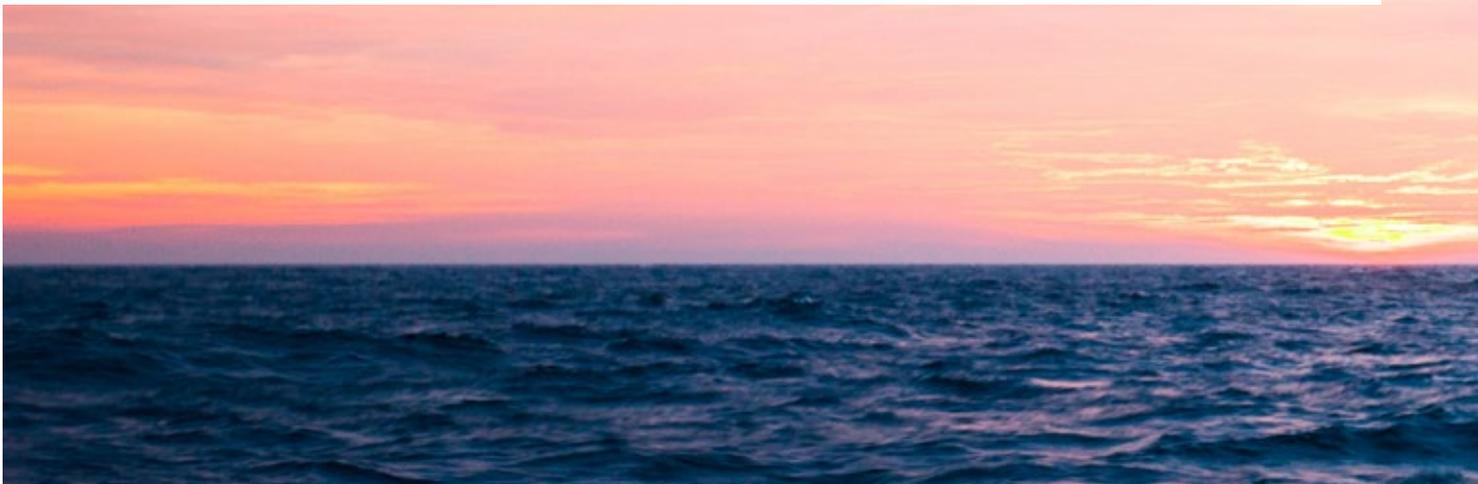
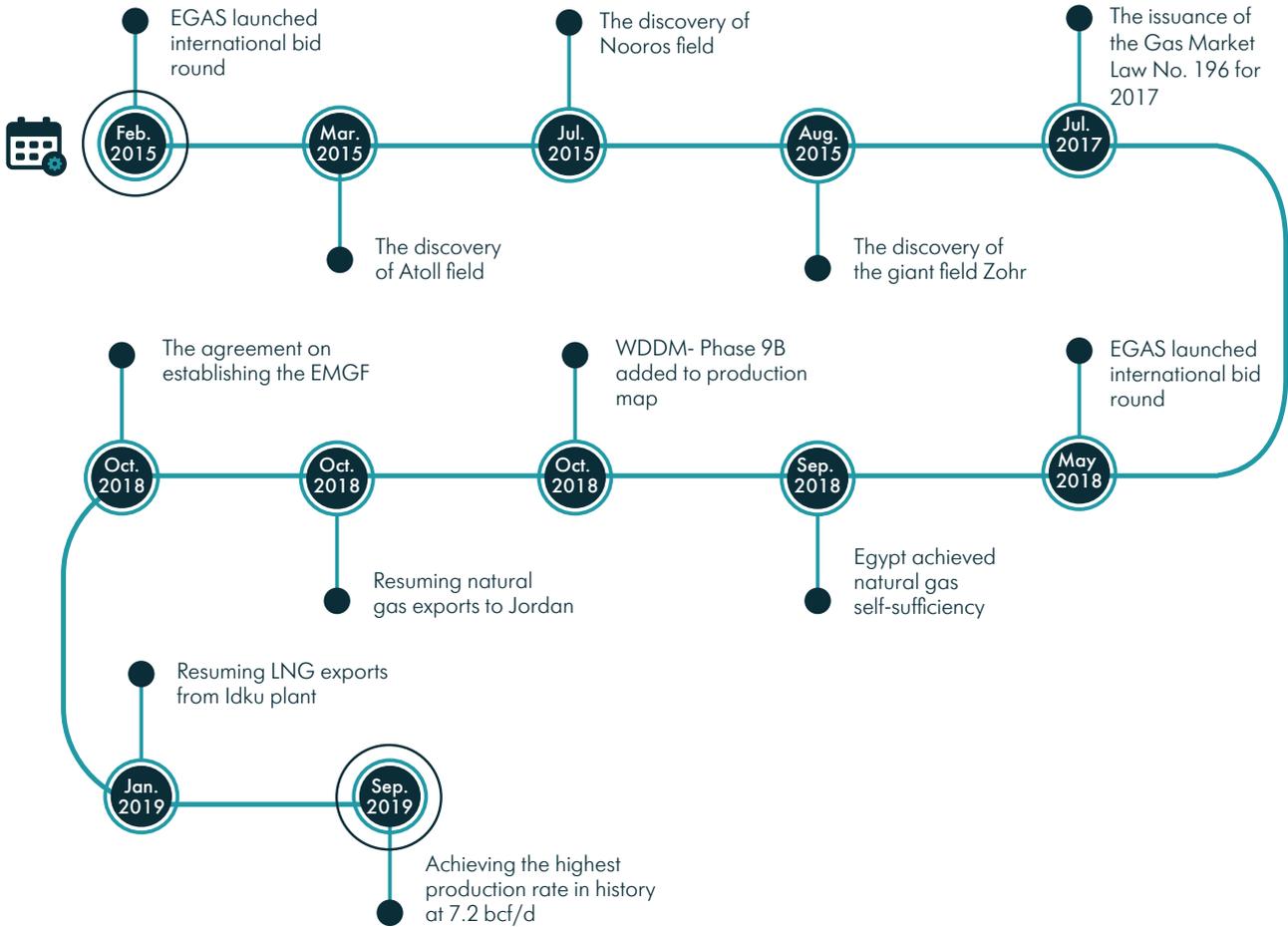
The GMRA was established to regulate, follow up, and control all activities related to the natural gas market in Egypt. According to the Gas Market law, the authority’s responsibilities include ensuring that natural gas infrastructure remains functional, and maintain a competitive market, free of monopolistic practices.



UPSTREAM ACTIVITIES



Summary of Natural Gas Industry's Milestones





UPSTREAM ACTIVITIES

B. CRUDE OIL

I. CRUDE OIL EXPLORATION AND PRODUCTION ACTIVITIES OVER FYs (2014/15-2018/19)

a. Discoveries

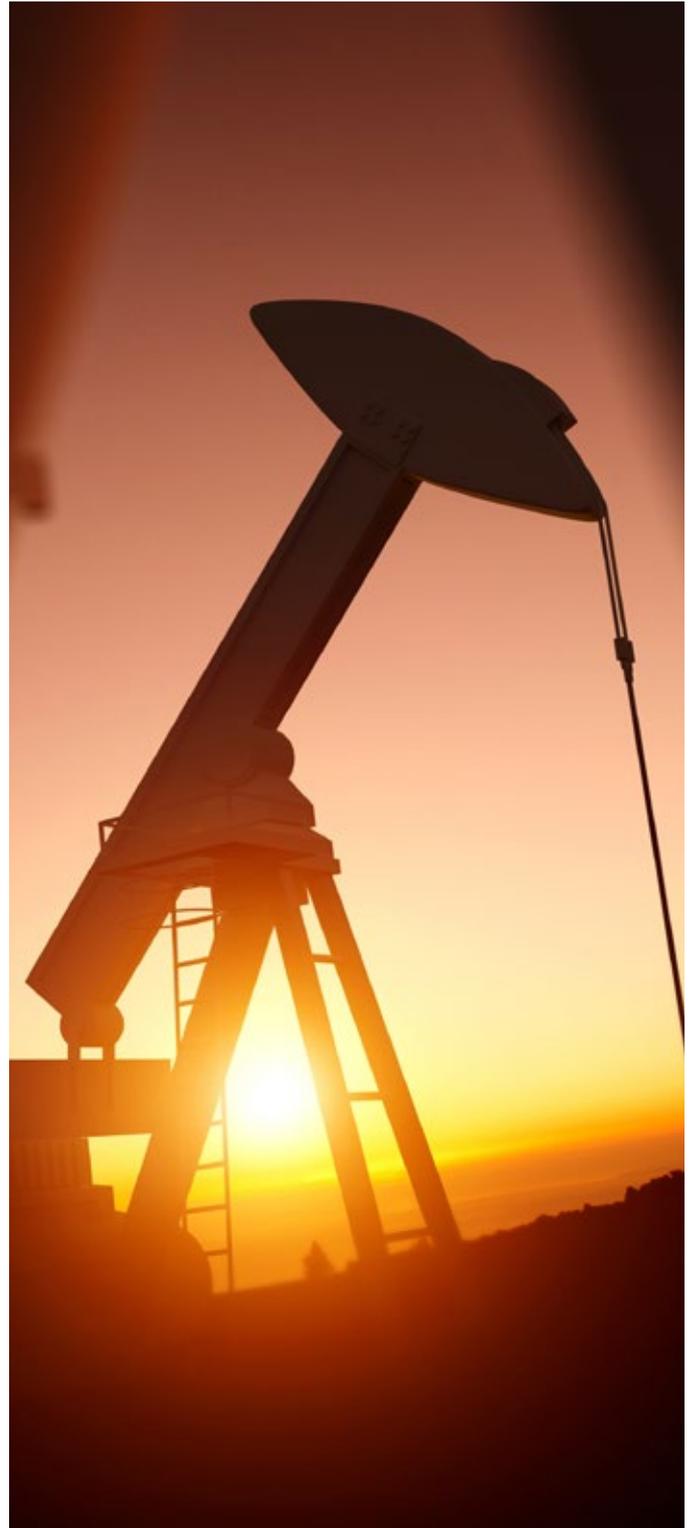
In FY 2014/15, 85 exploratory wells were resulting in achieving 34 crude oil discoveries. The Western Desert dominated the discoveries with 25 discovered wells.

The new discoveries added 77 mmbbl of crude oil to the reserves and 65 mmbbl of condensates leading the total reserves to reach 3.6 billion barrels by the end of June 2015, according to EGPC annual report FY 2014/15.

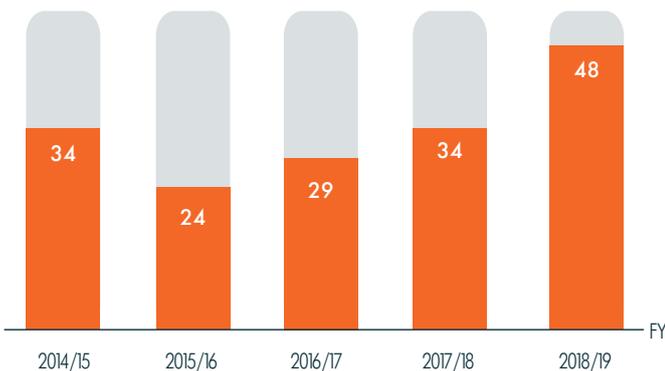
In FY 2015/16, the 56 exploratory wells were recorded causing the number of crude oil discoveries to reach 24 discoveries. These discoveries added 48 mmbbl of crude oil and condensates reserves, of which 17 mmbbl were crude oil. Total crude oil reserves reached 2.41 billion barrels by the end of FY 2015/16.

In FY 2016/17, 56 exploratory wells were drilled and resulted in achieving 29 discoveries. The new discoveries added reserves of 48 mmbbl of crude oil, according to EGPC annual report FY 2016/17.

In the following two years, during FYs 2017/18 and 2018/19, the number of discoveries significantly increased to 34 and 48 respectively.



Crude Oil Discoveries over FYs (2014/15-2018/19)



1. Ptah and Berenice

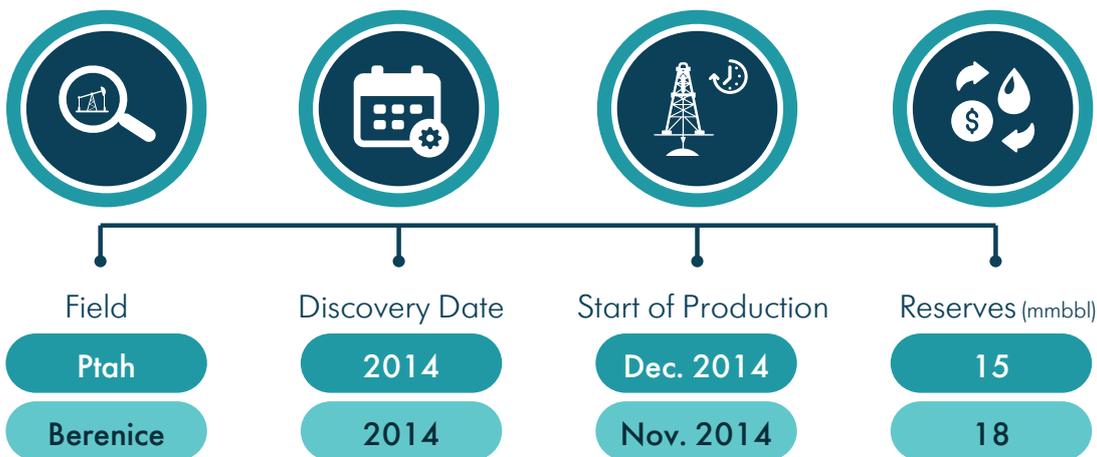
In 2014, Khalda announced the discovery of Ptah-1 in the Western Desert, with added reserves of 15 mmbbl of crude oil, according to EGPC annual report FY 2014/15.

The Ptah field started producing light oil in December 2014. The field well, Ptah-1X, has a production rate of 2,350 barrels per day (bbl/d), while the second well, Ptah-3X, started production in March 2015 at a rate of 2,000 bbl/d.

In the same year, Khalda further discovered Berenice-1 in the Western Desert, which added reserves of about 8 mmbbl of crude oil, according to EGPC annual report FY 2014/15. The Berenice field started producing light crude in November 2014. In March 2015, three wells were producing more than 9,500 bbl/d, according to a press release by Apache.



Ptah and Berenice Discoveries



2. Meleiha-101

In FY 2016/17, Agiba company discovered Meleiha-101 in Meleiha development area in the Western Desert.

The discovery is considered one of the significant discoveries in this year as it encouraged exploring and evaluating AEB D3

formation and other deep layers. The estimated added reserve of this discovery is about 0.9 mmbbl of crude oil, according to EGPC annual report FY 2016/17.

3. B1-X

In July 2018, Eni announced a light oil discovery on the B1-X located in South West Meleiha license, in Egyptian Western Desert, around 130 km North of the oasis of Siwa. The well has been opened to production in the Dessouky sandstones and has delivered 5,130 bbl/d of light oil with low associated gas.

The discovery is a significant one as it confirms the high exploration and production potential of deep geological sequences of the Faghur Basin.



UPSTREAM ACTIVITIES

4. Rudeis-Sidri

The Sidri-23 well was discovered in 2019 by Petrobel in Rudeis-Sidri development lease. The discovery's added reserves are estimated at 8 mmbbl of crude oil. The well was successfully connected to the production facilities aiming to produce crude oil at a rate of 3,000 bbl/d, which will increase to 4,000 bbl/d when more development wells are drilled.

Following this remarkable discovery, the appraisal well "Sidri-36" was discovered when it was drilled to assess the field continuity westward in a down dip position with respect to Sidri-23 discovery well, according to Eni's press release.

The well's initial production rate is expected to record approximately 5,000 bbl/d of crude oil, according to Eni's press release. The company added that the Sidri South discovery contains crude oil reserves estimated at 200 mmbbl.

b. Production Rates

Over the period from FYs 2014/15 and 2018/19, Egypt's crude oil production recorded a total of 1026 mmbbl, producing an annual average of 205 mmbbl.

 Rudeis-Sidri Discoveries



II. PETROLEUM EXPORTS

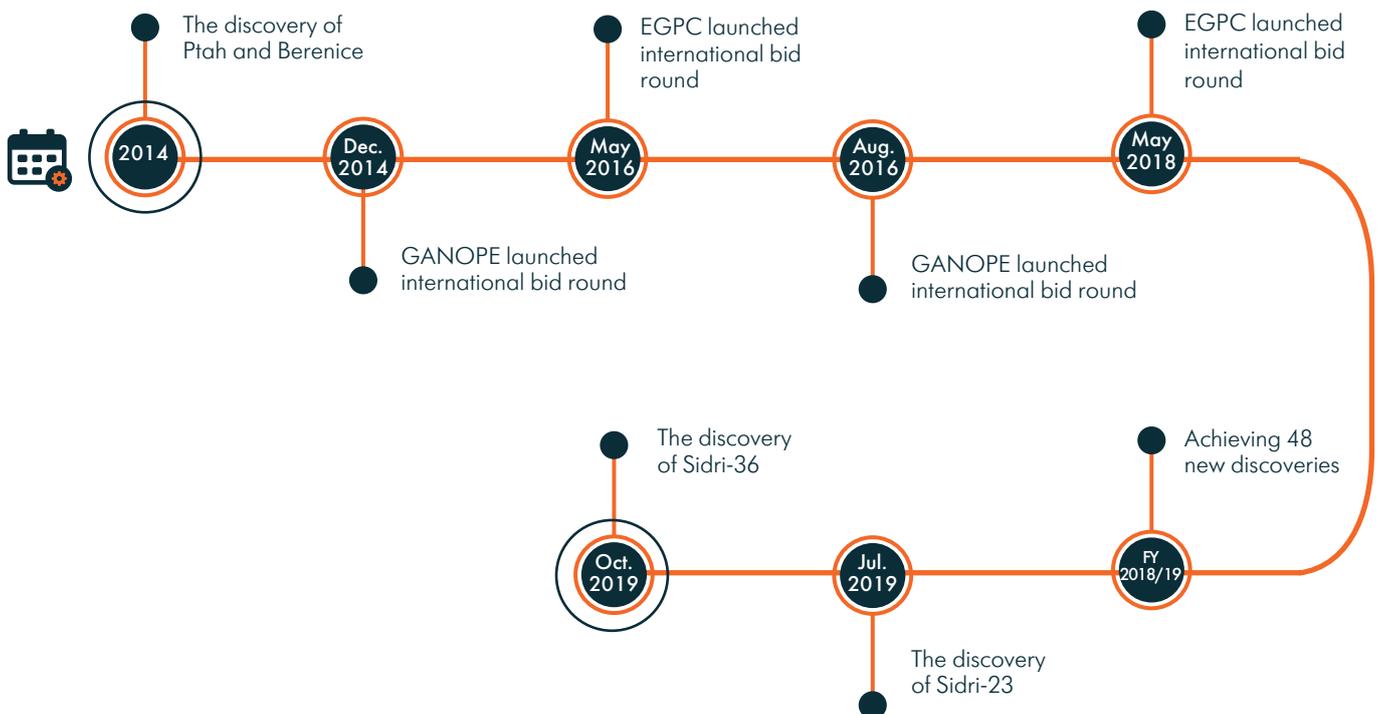
The petroleum exported quantities recorded an increase by approximately 56% from 16.1 million tons (mmt) in FY 2014/15 to 25.1 mmt in FY 2018/19. The significant increase in petroleum exports lead the country's petroleum trade balance to achieve a surplus of \$150 million in H1 2018/19, marking the first surplus in four years. The improving performance of petroleum exports over years assures that Egypt is moving in the right track towards being a regional oil and gas hub.



Petroleum Exports over FYs (2014/15-2018/19) (mmt)



Summary of Crude Oil Industry's Milestones







SECTION THREE
FOREIGN INVESTMENTS
IN THE UPSTREAM
ACTIVITIES





FOREIGN INVESTMENTS IN THE UPSTREAM ACTIVITIES

IOCS' INVESTMENTS IN THE PETROLEUM SECTOR

Over the course between FYs 2014/15 and 2018/19, the MoP has exerted remarkable efforts to encourage more IOCs to invest in the petroleum sector through reducing arrears, implementing projects and launching bid rounds for exploiting crude oil and natural gas fields.

Over the referred period, the petroleum sector's total foreign investments accounted for about \$40.4 billion and net Foreign Direct Investments (FDI) inflows reached about \$15.4 billion.

Since FY 2015/16, FDI has remarkably been increasing due to the discovery and development of fields in the Western Desert, Mediterranean Sea, Nile Delta and Eastern Desert. The development of Zohr offshore field has attracted a flood of investments in the Mediterranean region.

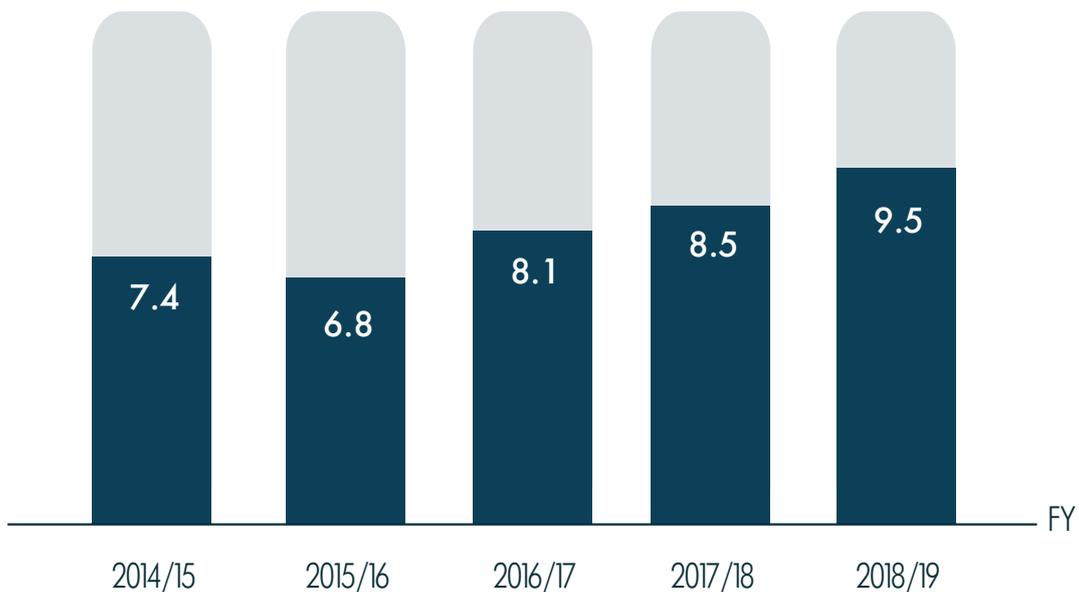
Consequently, FY 2016/17 witnessed a boom in the foreign investments steered to the petroleum sector. For the sector's total foreign investments, they amounted to about \$8 billion while the net FDI inflows outstandingly grew by about 150% to hit \$4 billion.

FY 2017/18 saw a jump in the foreign investments which recorded about \$8.5 billion with a share of 67% in total FDI inflows. Moreover, the year witnessed the highest net FDI inflows to the sector with \$4.5 billion.

In FY 2018/19, the petroleum sector's foreign investments significantly rose by 17% to \$9.5 billion, reaching its highest level over the past five years. These foreign investments contributed by 75% of the total FDI inflows to Egypt.



Total Petroleum Foreign Investments over FYs (2014/15-2018/19) (\$ billion)



ARREARS TO IOCS

Pre-FY 2014/15, the accumulated arrears to IOCs witnessed an increasing trend, specifically over FYs (2009/10-2011/12). The Egyptian economic slowdown, after the 2011 uncertainty, led the arrears to reach its highest value at \$6.3 billion in FY 2011/12. Subsequently, the arrears followed a fluctuating trend until reaching FY 2014/15.

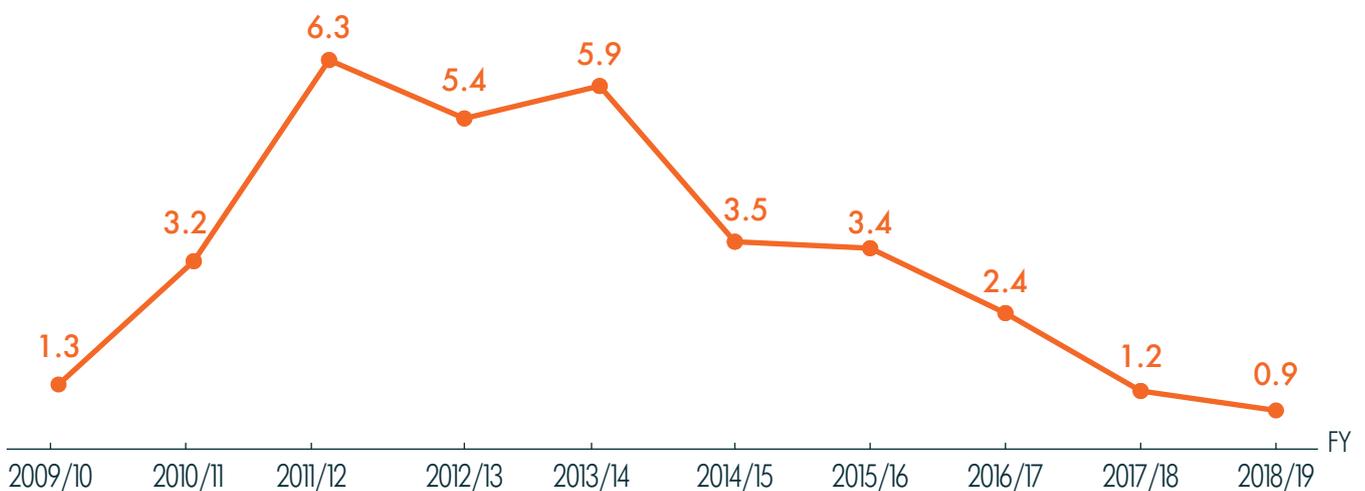
In FY 2014/15, the arrears significantly reduced by 41% to reach \$3.5 billion. Since then, the arrears have been steadily declining.

In FY 2017/18, the arrears were cut to half and accordingly the sector's net FDI inflows increased by about 13%. In FY 2018/19, the arrears reached an unprecedented value of \$0.9 billion,

which is the lowest debt value since FY 2009/10. With this regard, the foreign investments increased by 12%. It is worth mentioning that the arrears considerably declined by 74% in FY 2018/19 compared to that in FY 2014/15.

Paying off arrears boosts international confidence in the Egyptian market and encourages more international investments in the oil and gas exploration field. Moreover, reducing arrears was one of the MoP's efforts to achieve natural gas self-sufficiency and help Egypt become a regional energy hub.

 Arrears to IOCs over FYs (2009/10-2018/19) (\$ billion)







SECTION FOUR
REFINING
ACTIVITIES





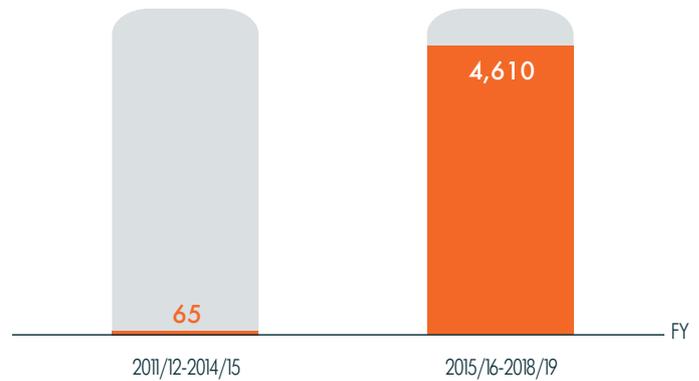
REFINING ACTIVITIES

The reform of the refining increased investments by \$4,545 million (EGP 72.43 billion) between FYs (2015/16-2018/19) compared to the period between FYs (2011/12-2014/15). Furthermore, the sector implemented five refining projects with \$4.6 billion (EGP 73.3 billion) worth of investments and initiated six other refining projects with \$8.3 billion (EGP 133 billion) worth of investments.

As for the petrochemical projects, two projects were implemented with EGP 72 billion worth of investments, which increased the petrochemical production to 4 million tons per year (mmt/y).



Implemented Investments in Refining (\$ million)



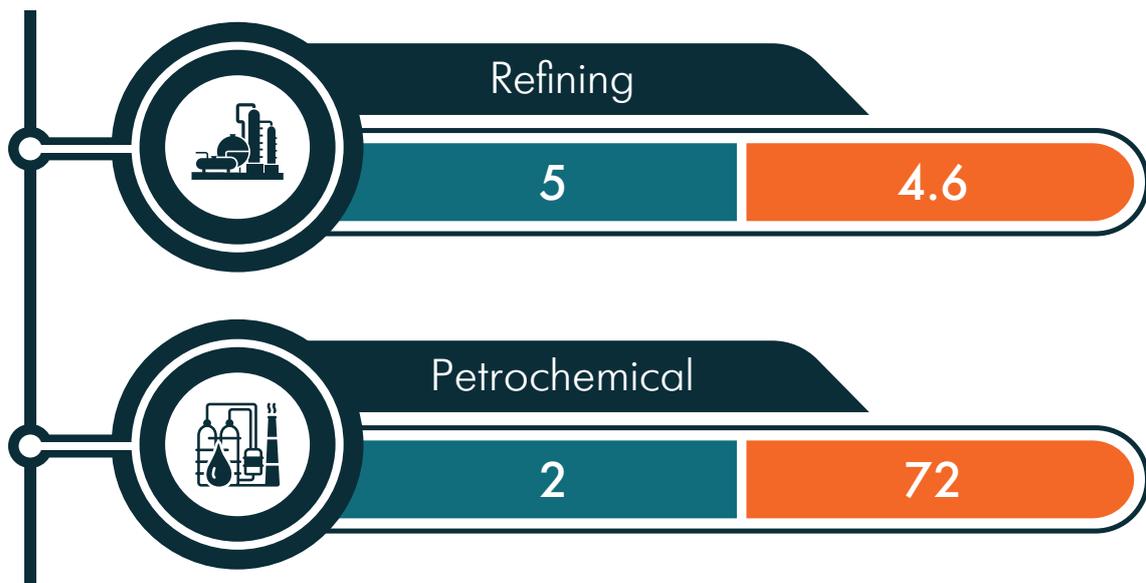
Petrochemical and Refining Projects Implemented over FYs (2014/15-2018/19) (\$ billion)



Number



Investments (\$ billion)



REFINING MARKET STATUS

Egypt is Africa’s biggest oil refiner with a total of 2 operating refineries, and a total annual capacity of 38 mmt in 2018. The domestic consumption of petroleum products slightly increased from 38.02 mmt in FY 2014/15 to record 39.4 mmt in FY 2015/16. However, the following years witnessed a declining

trend in the level of petroleum products consumption. Over FYs (2014/15-2018/19), the level of consumption of petroleum products has fallen by 18.6%. The consumption reached a low level of 31 mmt in FY 2018/19.

Petroleum Products Consumption over FYs (2014/15-2018/19) (mmt)



REFINING ACTIVITIES

CURRENT AND NEW REFINING PROJECTS

A. DEVELOPED STRATEGY

The MoP implemented a strategy in the refining sector to increase the country's refining capacity by 10% through developing and increasing the efficiency of existing refineries, in addition to developing the infrastructure to transport and trade of petroleum products. The strategy further targets increasing the quantities of imported crude oil to be refined, and adding new units to maximize the added value of petroleum products.

B. REFINING AND PETROCHEMICAL MAJOR PROJECTS

I. REFINING PROJECTS

a. MIDOR's Expansion

In 2017, the first phase of the refinery's expansion was operated, which increased MIDOR's total production capacity by 15%. In 2018, a new project was implemented to increase MIDOR's refining capacity by 60%. This project costs \$2.3 billion (EGP 36.7 billion) and is planned to be completed in Q1 2022.

b. High-octane Gasoline Production Unit at ASORC

The construction of a high-octane gasoline production unit in Assiut Oil Refining Company (ASORC) has started in 2017, and is under implementation. The unit produced 800,000 tons per year (t/y) of high octane gasoline. The project's investment cost is \$450 million (EGP7.2 billion) and is planned to be fully executed by April 2020.

c. Hydrocracking Complex at ERC

The refinery has a production capacity of 4.7 mmt/y of refined products, according to the ERC website. The project comprises of a hydrocracker complex to convert fuel oil into high-quality petroleum products, with total investments of \$4.3 billion (EGP 68.5 billion). The project started its trial operations in 2019.





d. Hydrocracking Complex at ANOPC

The project consists of a fuel oil hydrocracker complex with a feed capacity of 2.5 mmt/y, in order to convert fuel oil into high quality petroleum products. The project's total investments are around \$2.15 billion (EGP 34.3 billion) and is planned to be completed by 2022.

e. Hydrocracking Complex and Production of Gasoline (Red Sea Co.)

The project targets exploiting the surplus and untapped capacities of El Nasr refinery and Suez Oil Processing Company (SOPC), in addition to benefiting from the produced fuel oil to manufacture high-quality petroleum products. The project has a feed capacity of 2.5 mmt of fuel oil, in addition to 1 mmt of Naphtha. The project is planned to complete by 2022, with costs of \$2.75 billion (EGP 43.8 billion).

f. Rehabilitation of Coking Complex at SOPC

In 2019, a project started to rehabilitate the coking complex at SOPC. The project targets increasing the production capacity to 1.75 mmt of fuel oil per annum to maximize the quantity of middle distillates. The project is planned to complete by March 2022, with investments estimated at \$588.6 million (EGP 9.4 billion).

g. Asphalt 60/70 production unit at SOPC

The project intends to establish a vacuum distillation unit with production capacity of 726,000 t/y of mazut in order to produce around 396,000 t/y of Asphalt 60/70 to cover the local market needs. The investments to implement the project are estimated at \$68.5 million (EGP 1.1 billion). The project is expected to complete in Q4 2021.

REFINING ACTIVITIES

h. High-octane Gasoline Production Project in ANRPC

The implementation of high-octane gasoline production project at Alexandria National Refining & Petrochemical Company (ANRPC) started in 2015. The project was completed by September 2018. This project aims at increasing the high-octane gasoline production capacity to 1.5 mmt/y.

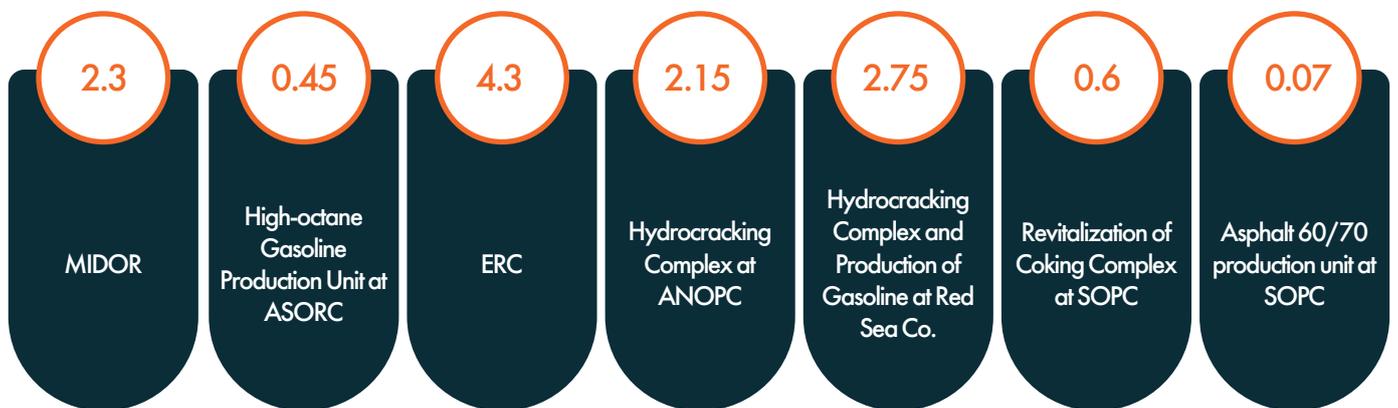
i. Aromatics Extraction Units Project at APC

The project aims at renewing the oils complex at Alexandria Petroleum Company (APC) and increasing the oils production to reach a range between 10,000 and 16,000 t/y and a wax production of 1,000 to 2,000 t/y. The increase is planned to be executed through exchanging furfural with a N-methyl pyrrolidone (NMP) material in the aromatics processing unit. The projects' supplies are expected to complete by Q1 2020. The project investment cost is estimated at EGP356.5 million.

Investments Directed to Refining Projects over FYs (2014/15-2018/19)

Project

Investments (\$ billion)



II. PETROCHEMICAL PROJECTS

a. Ethylene and its Derivatives Complex at Ethydc

In 2016, the complex was launched with production capacity of 460,000 t/y of ethylene, 400,000 t/y of polyethylene and 20,000 t/y of polybutadiene.

The project supported the Egyptian economy by providing around 10,000 job opportunities. The total investments in the complex reached \$2 billion (EGP 25.9 billion).

b. The Expansion Project of MOPCO

The expansion project of Misr Fertilizers Production Company (MOPCO) was completed in 2016. The project aimed at reaching a production capacity of 1.4 mmt/y of urea. The project's investment cost reached \$2 billion (EGP 25.9 billion) and it also helped in providing 5,000 job opportunities.

c. Polypropylene Production Project at Sidpec

The project aims to produce polypropylene with a production capacity of 450,000 t/y, not only to cover domestic demand, but also to export the surplus. The project depends on exploiting the quantities of propane available in the facilities of Egyptian Natural Gas Company (GASCO) in Alexandria instead of exporting them. The investment cost of the project is \$1.6 billion (EGP 25.5 billion), and it is planned to complete by the end of Q1 2022.

d. MDF Production (WOTECH Company)

In 2018, a project started to produce an annual product 205,000 m³ of Medium-Density Fiberboard (MDF) using 210 mmt/y of Egyptian rice straw as the project's main raw material.

The investment cost of the project is EUR 210 million (EGP 3.72 billion), and is planned to be completed by Q4 2021.

e. The Project of Producing Formaldehyde and its Derivatives

In 2019, operations to implement a project that will produce formaldehyde along with its derivatives have started. The project aims to annually produce 52,000 tons of urea formaldehyde and 26,000 tons of sulfonated naphthalene formaldehyde (SNF) using the methanol and urea produced at Emethanex and MOPCO. The investment cost of the project is \$50 million (EGP 796.8 million) and it is planned to complete by Q2 2021.



REFINING ACTIVITIES



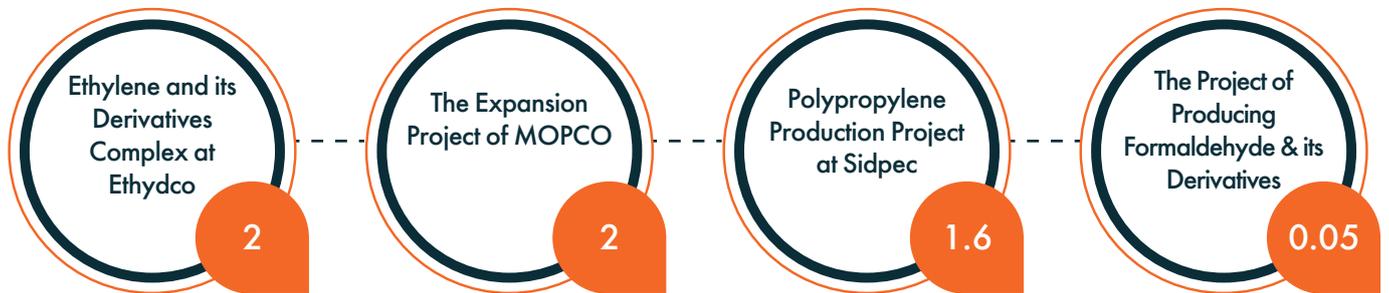
Investments Directed to Petrochemical Projects over FYs (2014/15-2018/19)



Project

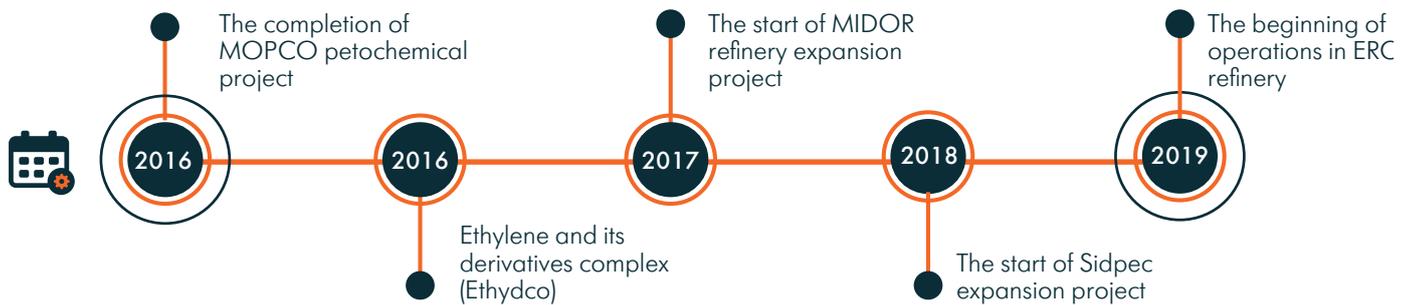


Investments (\$ billion)





Summary of Refining and Petrochemical Industry's Milestones over FYs (2014/15-2018/19)







SECTION FIVE
DOWNSTREAM
ACTIVITIES

DOWNSTREAM ACTIVITIES

NATURAL GAS PROJECTS

A. NATIONAL GRID DEVELOPMENT

In light of the upgrading plan for the national gas grid and preserving assets complying with the standard maintenance procedures for gas pipeline projects, EGAS has been successfully working on a number of national gas grid pipeline projects since FY 2014/15. Over FYs 2014/15 to 2018/19, over 30 natural gas pipelines were constructed with total costs of about EGP 8.7 billion, according to EGAS Annual Reports 2014/15 to 2018/19.

In FY 2014/15, the petroleum sector succeeded in completing nine natural gas pipeline projects, representing the highest number of implemented projects over the referred period. The projects' total costs of EGP 1.3 billion. By the end of the year, the natural gas national grid reached a total length of 40,000 km with a capacity of 7.6 tcf of transported natural gas.

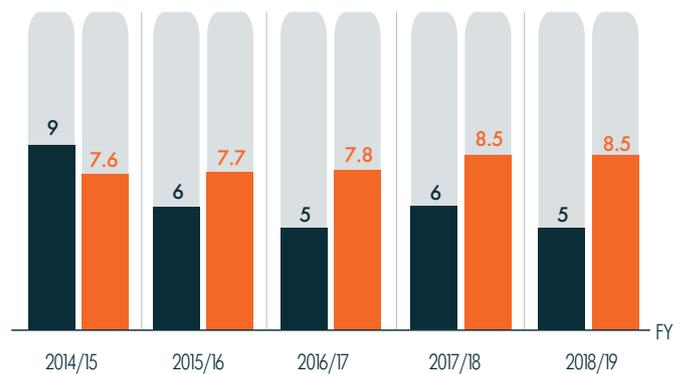
Over FYs 2015/16 and 2017/18, over 15 natural gas pipeline projects were implemented with total costs of about EGP 3.5 billion. Over this period, the natural gas capacity increased from 7.7 tcf to 8.5 tcf.

National Gas Grid Development over FYs (2014/15-2018/19)

 Number of Projects

 Capacity (tcf)

 Total **31**



FY 2018/19 witnessed the execution of five natural gas pipeline projects with relatively great costs of EGP 3.9 billion. It is worth mentioning that the length of the natural gas national grid increased by 50% in FY 2018/19 compared to FY 2014/15 as it extended from 40,000 km up to 60,000 km. Meanwhile, the natural gas capacity rose by 12% from 7.6 tcf to 8.5 tcf.



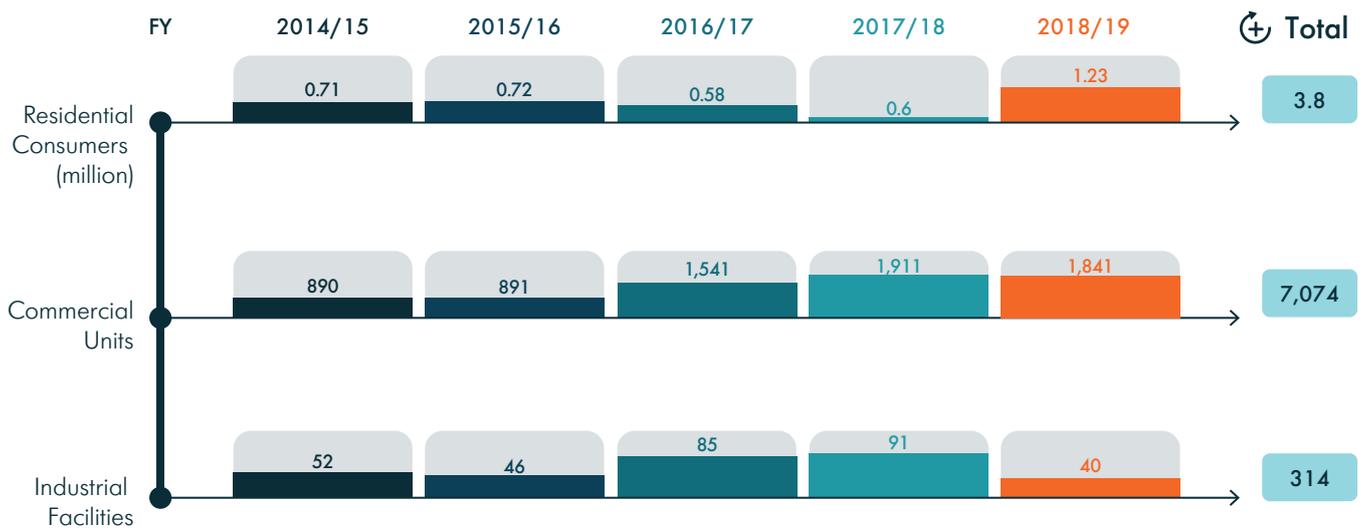
NATURAL GAS CONNECTION

With the aim of reducing the government burdens aroused from importing butane for local consumption, the MoP started an activity to replace butane with natural gas in 1981. With this regard, the total connected consumers with natural

gas reached about 3.8 million residential consumers, 7,074 commercial units and 314 industrial facilities over FYs (2014/15-2018/19), according to EGAS Annual Reports from 2014/15 to 2018/19.



Natural Gas Connections over FYs (2014/15-2018/19)



In FY 2014/15, the connected residential consumers with natural gas increased by 7% to reach about 0.71 million, making the total residential consumers 6.9 million since the beginning of the activity. On the other hand, 890 commercial units were connected so the total reached 14,433 units. For the industrial facilities, 52 connections took place driving total facilities to 2,269.

In the framework of the continuous efforts exerted by the MoP, the rate of connected residential consumers with natural gas has remarkably evolved to account for about 1.9 million consumers, over FYs 2015/16 to 2017/18. Meanwhile, the

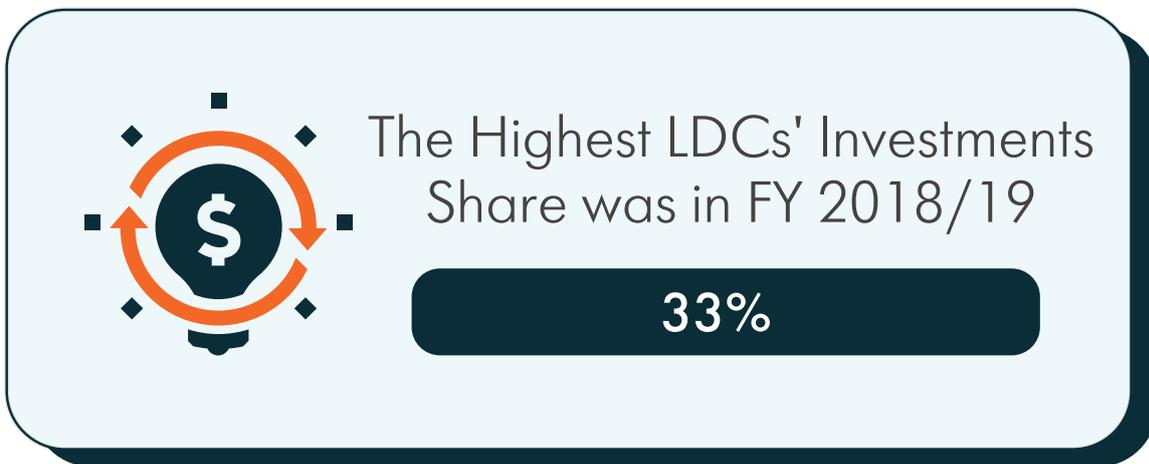
connected commercial units amounted to 4,343 units. For the connected industrial facilities, they recorded 222 units. One of the most significant features of this period is the delivery of natural gas to 36 new areas in FY 2016/17. With the support of a governmental initiative to deliver the natural gas to houses for EGP 30 per month over the course of six years, natural gas was successfully delivered to 1.23 million residential consumers in FY 2018/19; increasing by over 100% compared to FY 2017/18. Hence, the year witnessed a significant leap, achieving the highest residential connections since beginning of the activity.



DOWNSTREAM ACTIVITIES

Since the beginning of the activity, the natural gas connections have been increasing. The total number of connected residential consumer, commercial units and industrial facilities recorded 10 million, 20,610 and 2,531, respectively until June 2019. They notably increased by 48%, 43%, and 14%, respectively, in FY 2018/19 compared to FY 2014/15.

The local Distribution Company (LDC) play a vital role in downstream activities through pumping investments to implement natural gas connection projects. Over FYs 2014/15 to 2018/19, the total investments spent by the LDCs on the natural gas connection projects amounted to EGP 9.2 billion. These investments doubled in FY 2018/19 to reach EGP 3 billion compared to EGP 1.5 billion in FY 2014/15.

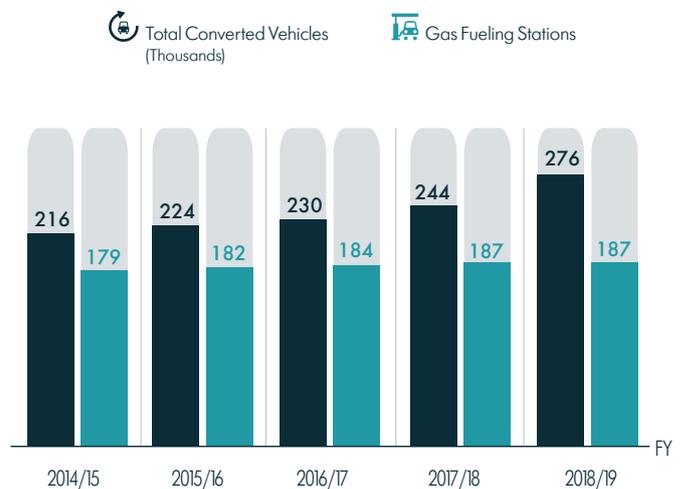


VEHICLES CONVERSION INTO NATURAL GAS

Within the framework of fulfilling the national strategic goal to preserve the environment, the activity of using Compressed Natural Gas (CNG) in vehicles has expanded as environmentally clean fuel to reduce the combustion of fuel by the gradual replacement of natural gas for vehicles.

Over the referred period, the activity of converting vehicles into natural gas has achieved unprecedented results, supported by the state's reform decision concerning the structure of the petroleum products' pricing. A total of new 71,912 vehicles were converted into natural gas through 72 conversion centers and 187 gas fueling stations, stated in EGAS Annual Report from 2014/15 to 2018/19.

Vehicles Conversion into Natural Gas over FYs (2014/15-2018/19)



In the context of following up the implementation of the activity's expansion programs, the demand for the use of natural gas as a fuel for vehicles was observed in FY 2014/15 when 11,500 vehicles were converted through 71 conversion centers and 179 gas fueling stations. Hence, the total number of converted vehicles reached 216,000 vehicles this year.

Since then, the conversion of the vehicles has been following an increasing trend. Over FYs 2015/16 to 2017/18, more than 20,000 vehicles were converted through establishing nine new

gas fueling stations. Within this period, FY 2017/18 witnessed a rebound where the newly converted vehicles increased by more than 100% to reach 13,732 vehicles.

In FY 2018/19, the number of newly converted vehicles jumped by 135% reaching 32,280. It is important to note that the total number of converted vehicles into natural gas increased by 28% in FY 2018/19, in comparison to FY 2014/15. Accordingly, the converted vehicles totaled 267,000.







SECTION SIX
THE PETROLEUM
SECTOR'S
SUSTAINABILITY





THE PETROLEUM SECTOR'S SUSTAINABILITY

THE ROLE OF HR MANAGEMENT IN THE PETROLEUM SECTOR

Promoting the efficiency of human capital is one of the main objectives of the petroleum sector. The targeted level of efficiency can be achieved through promoting new administrative system to develop the employees. This could be achieved through creating an advanced database for all workers in the sector, preparing leadership program by establishing a mechanism for evaluating and selecting the best candidates.

The Modernization Project's third pillar is focused on HR management. One of the pillar's features was Zohr's development program that started in August 2017 with 287,874 training hours, and 74,695 as a total participation.

Moreover, under the modernization project, a program for qualifying middle management calibers was launched to choose the best young people through means of exams and interviews. The program also depends on the coordination with various foreign companies to provide specialized programs that include a practical training period. The main principles of the Middle Management Development Program are transparency, cooperation and co-integration, creativity, sustainability, providing equal opportunities, credibility and commitment.



Middle Management Program Selection Process

2933

Applicants for the program's 1st edition

711

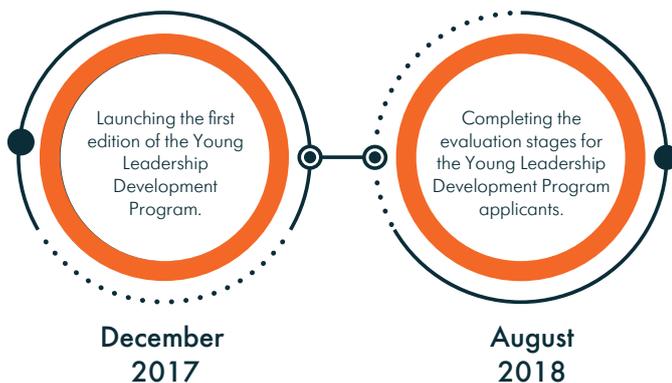
Candidates who passed the assessment's 1st phase (Written Exams)

465

Candidates who passed the 2nd phase (interviews)



Middle Management Development Program



Promoting Sector Employees

Dec 2017

Preparing a succession plan for the leadership positions.

Dec 2017

Studying proposals to achieve the optimal utilization of human cadres.

Jan 2018

Creating a database with unified standards for the sector's employees.

THE DIGITIZATION AND ADOPTED TECHNOLOGY ROLES IN PROMOTING THE PETROLEUM SECTOR

Digital transformation is the main trend affecting the global oil and gas sector. It is the process of accelerating innovation to take place. The petroleum sector sees that the technological

changes have a great impact on the performance of the petroleum companies making it more efficient and increasing integration between them.

A. MOP'S DIGITALIZATION INITIATIVES

In 2014, the Egyptian petroleum sector started its digitalization journey through adopting a digital transformation strategy to improve the sector's efficiency and achieve the sector's safety, highest productivity levels, accessibility and sustainability of energy. The strategy embraces three main initiatives. The first

initiative is the launch of Egypt's Digital Data Bank to attract new investment opportunities. The second initiative is to work on the business' improvement, and automation through using real-time data. Finally, the third initiative is concerned with setting a digitalization roadmap to sustain the initiatives.

I. EGYPT'S FIRST DIGITAL DATA BANK

The MoP initiated Egypt's Upstream Gateway (EUG) project in November 2018. It is a data bank called the National Data Repository, which aims to provide E&P with data in a reliable organized manner and electronically promote bid rounds through international information networks with seamless access and on-line data management.

EUG's main objectives are the adoption of an active data management technique, the preservation of legacy data, the enhancement of regulations and licensing and working on promotion.

For the EUG project status, four Memoranda of Understanding (MoUs) were signed with Schlumberger, Baker Hughes, Halliburton & CGG. A number of technology sessions took place in cooperation with major solution providers to determine the key strengths and weaknesses for each provider.

After the project scope was approved, EGPC was delegated to call for tender. In August 2018, Requests for Information (RFIs) were sent to the service providers. The EGPC received the RFIs in February 2019 and Schlumberger company awarded the project. The project contract will be signed in February 2020.

II. BUSINESS PROCESS IMPROVEMENT AND AUTOMATION

a. Egypt's Oil and Gas Modernization Project

The Modernization Project includes a program for establishing digitized and automated solutions in order to organize the

business process across Oil & Gas value-chain, to apply the best practices for improvements.

b. Enterprise Resource Planning

Besides the Modernization Project, the Enterprise Resource Planning (ERP) is a significant system for integrating industrial systems to realize the target objectives. The ERP system depends on SAP Model (Systems Applications and Products

in Data Processing) for its implementation in EGAS, EGPC and Egyptian Petrochemicals Holding Company's (ECHEM) affiliated companies.

1. EGAS & Affiliates ERP Implementation



EGAS & Affiliates ERP Implementation



Town Gas

Completed Phase 1 & Planned to include Document Management system and BI in Phase 2



Egypt Gas

In the Implementation Phase



Cairo Gas

In the Implementation Phase



Petrotrade

Issued the RFP and in the evaluation process



Gas Cool, Syanco, Sinai Gas, ReGas, ECGS

To be hosted in EGAS as phase 1 to speed the process and minimize cost

2. EGPC & Affiliates ERP Implementation

The second phase of ERP was assigned to Jupiter 2000, which is a Business Solution Consulting Company in November 2018. The phase was applied on planning and projects deputy (for selected processes), foreign and joint venture companies' deputy, exploration deputy, financial deputy and public sector investment budget.

For EGPC affiliate, ERP, six refineries' designs were completed on January 23, 2020. Since ENPPI and SAP will be finalizing the design documents by January 30, 2020, the design documents were almost completed by 95.8%.

Concerning the refineries implementation phase, the Expression of Interest (EOI) was issued in November 2019. Measurement Request (MRQ) was issued on January 27, 2020. According to the set plans, the Process Orchestration (PO) is

to be issued for a successful SAP implementer in March 2020.

The first refinery is expected to be completed in March 2021 and an additional six months for roll-out for the remaining refineries.

For the sales and distribution companies design, in July 2019, SAP conducted the onsite scope review sessions for marketing and distribution companies.

Moreover, in October 2019, EGPC and Enppi made a scope review meeting to complete the scope for distribution companies. The expected date for completion is in August 2020 and the expression of interest date is expected to be issued in June 2020. The PO is to be issued for a successful SAP implementer in October 2020.

3. ECHEM & Affiliates ERP Implementation

A contract was signed for upgrading the ERP system in ECHEM and its affiliates and will be implemented in February 2020.



ECHEM & Affiliates ERP Implementation



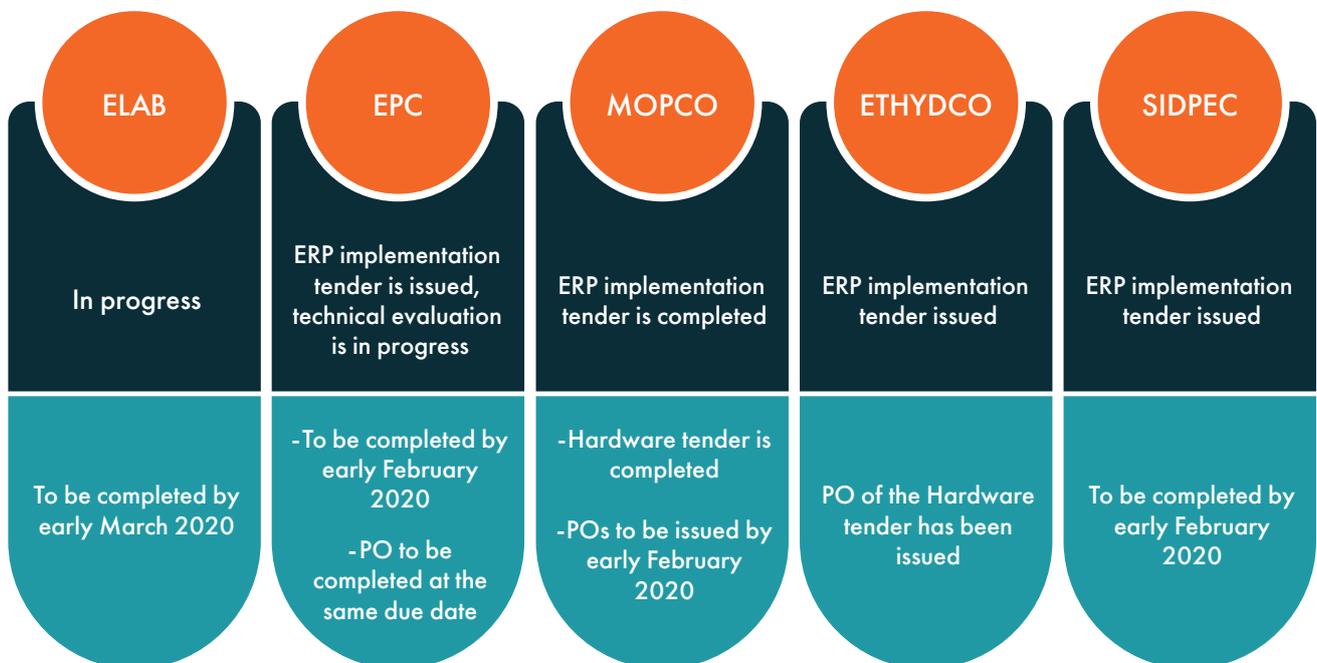
ECHEM Affiliates



ERP Implementation



Hardware Tender





THE PETROLEUM SECTOR'S SUSTAINABILITY

c. Sector's Intranet

The intranet (Known as: Egypt Petronet) is an official gateway to achieve communication and collaboration among sector employees. With this regard, Steerco action was implemented in August 2017 to develop the sector-wide intranet. In 2018, "Egypt Petronet Collaboration Platform " was established

to enhance collaboration and integration among sector employees. In February 2018, Modernization project's pillar seven soft-launched Egypt Petronet for 20,000 employees. In 2019, SAP services Agreement with EGPC was signed for refineries and distribution transformation.

d. Sector- Wide Connectivity

Sector-wide Connectivity is a solution that implements robust security by setting a secure data flow between production systems in companies and the centralized production database in EGPC.

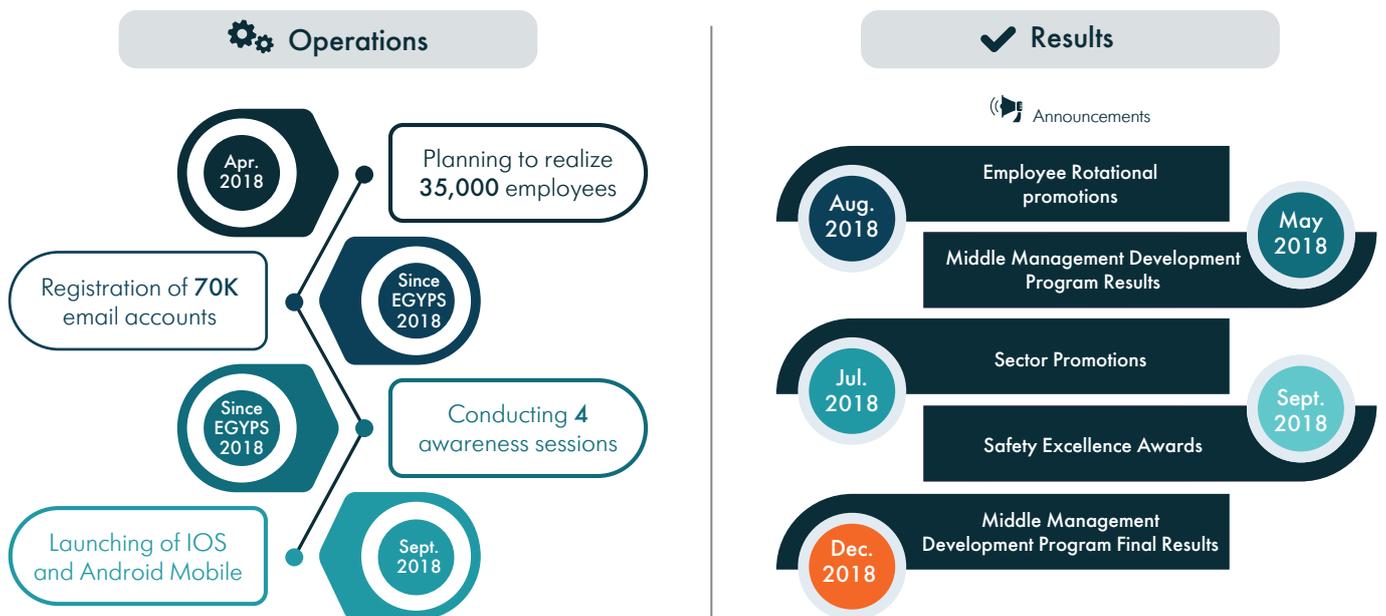
For EGPC, 37 out of 72 are connected. For EGAS affiliates, 16 out of 24 are connected, five of which are facing technical problems and three refused the connection (i.e. UGDC,

ELNG and EPGDCO). Concerning ECHM, three out of six are connected, in which three are having authorization issues with TE-Data.

For Ganope, three under civil work are connected; while seven have authorization issues with TE-Data.

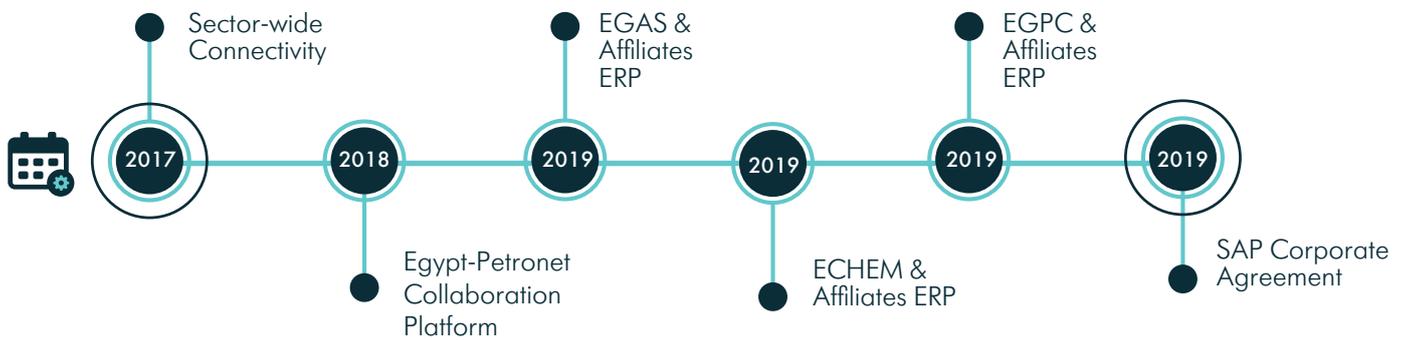


Sector's Intranet Status





Business Process Improvement and Automation Timeline





THE PETROLEUM SECTOR'S SUSTAINABILITY

III. DIGITIZATION ROADMAP

The MoP managed to cooperate with the European Union (EU) to set a digitization roadmap covering the Oil & Gas value chain. Numerous workshops, discussions, system-reviews and business interviews took place to form a successful sector digital transformation in the near future and beyond to fulfill Egypt 2030 vision.

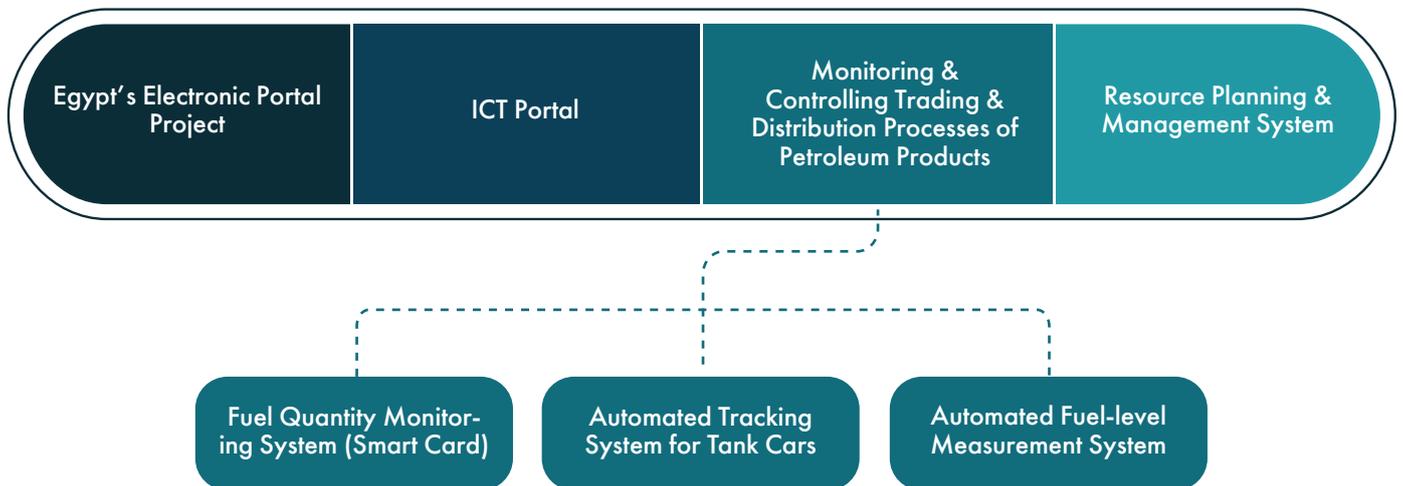
In October 2019, the digitization roadmap helped the MoP to introduce the Decision Support System (DSS) using the latest

technologies and real-time dataflow. In November 2019, the EU expertise presented a Front-End Engineering Design (FEED), to interpret the Egyptian petroleum sector. The digitization roadmap as a third platform, is based mainly on the Internet of Things (IoT). The IoT is composed of big data (i.e. analytics), mobility, cloud and social business.

B. THE DIGITALIZATION PILLARS



The Digitalization Pillars



I. EGYPT'S ELECTRONIC PORTAL PROJECT

The MoP has established an electronic portal for promoting the Oil and Gas E&P activities. The portal aims at marketing

of oil exploration areas in cooperation with IOCs in order to attract investment opportunities and promote these areas.

II. INFORMATION AND COMMUNICATION TECHNOLOGY PORTAL

The Information and Communication Technology (ICT) strategy facilitates realization of sector's vision through its alignment with the business strategy using latest digitization and automation industrial standards. On the other hand, the new ICT Strategy enables the small and medium companies to have a benchmark to build their technological environment. Furthermore, it is a baseline for larger entities to ensure the best practices for the business. With this regard, the MoP formed a

unified sector ICT Strategy and a Strategy Deployment Team (SDT) for making action plans.

During a session entitled "The Digital Transformation in the Oil and Gas Industry" in the 23rd edition of "Cairo ICT 2019" in January 2019, the minister affirmed that the sector's modernization project aims to implement important reforms in all areas of the petroleum industry, supporting the digital transformation.

III. RESOURCE PLANNING AND MANAGEMENT SYSTEM

The resource planning and management system has been applied in EGPC and all petroleum holdings including its subsidiaries. The MoP also started implementing the system in

the refineries and the marketing companies affiliated to EGPC. The system helped in developing and improving procedures, efficiency and data flow.





HSE & ENERGY EFFICIENCY IN LIGHT OF MODERNIZING THE PETROLEUM SECTOR

A. HSE

I. HSE COMPLETES THE MODERNIZATION PROJECT'S PICTURE

Under the umbrella of the Modernization Project, health, safety and environment (HSE) comes as a top priority to secure the industry's work environment. Thus, the MoP has endeavored to ensure safety on both levels; the employees' safety and the occupational safety.

In this regard, the MoP followed several tracks to secure the oil and gas sector. The ministry seeks at all times to achieve the highest levels of international performance of HSE and commit to the HSE regulations and laws. To provide a proper HSE management and a risk management approach, the ministry provides training programs and workshops to the employees to enhance their HSE awareness.

II. HSE EVENTS

The MoP was notably keen to organize a number of prominent events to promote the execution of its belief. The ministry conducted the annual Safety Day, along with its Safety Week, to make sure that every petroleum entity follows a robust HSE system.

During the Safety Day event, held in December 2019, IOCs as well as national oil companies (NOCs) followed up on the latest



HSE system implementation, discussing the importance of this approach to increase employees' awareness.

Furthermore, HSE measurements will be included to individual assessments of all employees on a quarterly basis to enhance their safety behavior.

III. SAFETY DRIVING, CONTROL OF WORK, CONTRACTOR'S MANAGEMENT

The MoP studied the main reasons behind the sector's accidents, and found out that driving vehicles, control of work (CoW) in addition to contractor's management are the most fields causing problems in the sector. So, the ministry seeks to tackle these through improving the employees' culture and behavior towards safety as well as rising the awareness of applying the CoW.

On the topic of safety driving, a safety driving workshop has been conducted to review the seven elements of the driving policy with a focus on the technology that has been

The MoP is going to establish a high HSE committee to be responsible for governing the safety system and posting unified rules and policies in line with the international standards, in addition to supervising law's execution.

implemented to manage journeys and affect drivers' behavior. For the CoW, a workshop has been conducted focusing on the indicators of HSE leadership, how to commit to change as well as commit to zero incidents.

In addition, workshops were held for contractor's management, addressing six main challenges; lack of HSE leadership and culture, lack of communication in the oil and gas sector, shortage of qualified resources, no proper documentation, lack of competency, and no clear rules and responsibilities.





THE PETROLEUM SECTOR'S SUSTAINABILITY

IV. HSE REGULATIONS AND LAWS

The minister selected Occupational Safety and Health Administration (OSHA), which is an international agency implementing Process Safety Management (PCM) systems, to be the main guideline followed by the Egyptian petroleum companies.

OSHA sets standard regulations for managing hazards in the work processes to ensure the availability of a safe and secure working environment for the sector's employees.

The agency has 14 elements that are required to be implemented by employers. The first element requires the employees' participation in the development and execution of the PCM program. The second one ensures the employer provides enough information about the possible chemical hazards as well as the know-how of the equipment and technologies. The third element requires the employer to conduct accurate hazard analysis.

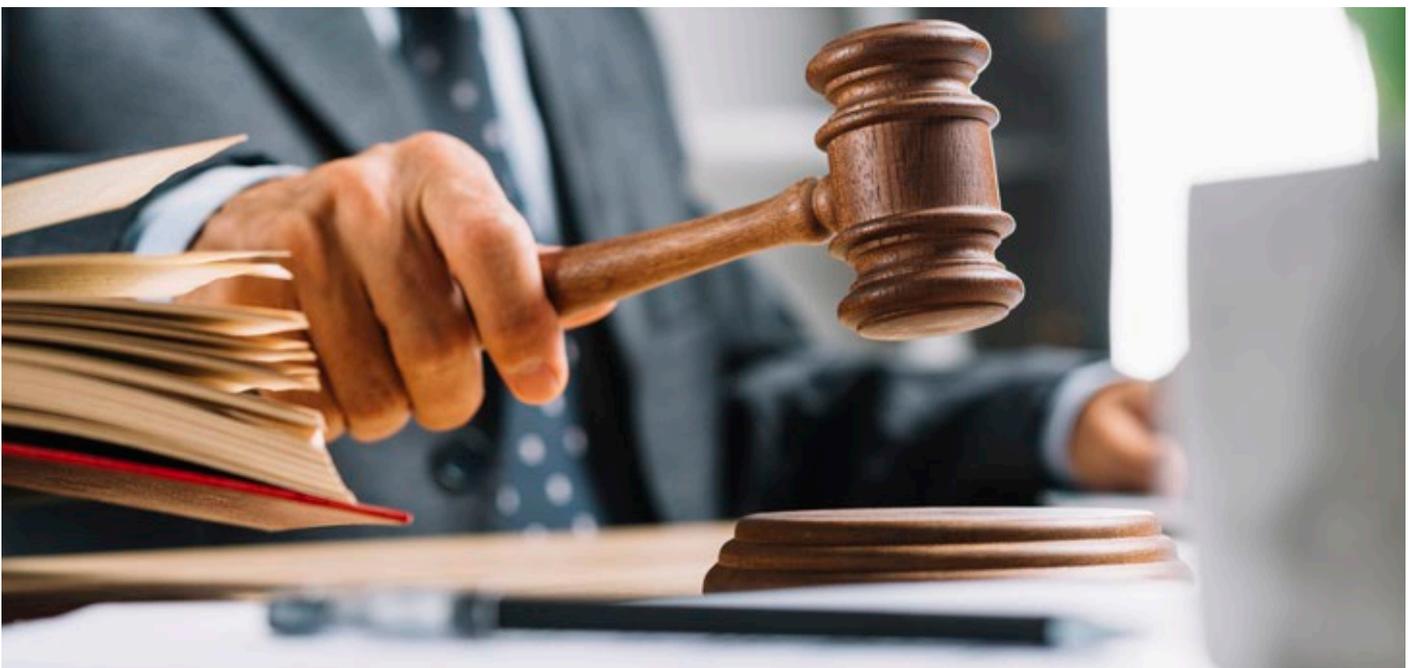
The fourth element is about the development and implementation of the written procedures. The fifth focuses on providing all involved contractors and employees with appropriate training before beginning any process to ensure safe work practices. The sixth element states that all

contractors involved in the processes must be evaluated to affirm that they have the appropriate capabilities as well as a safety history.

The seventh element focuses on performing a detailed review of any new or a modified system. The eighth relates to mechanical integrity aiming at developing and implementing a methodical program for performing appropriate maintenance to discover any deficiencies in the equipment.

The ninth element is about developing a formal program to prevent fire and explosions from occurring. The tenth institutes documented procedures that aim to ensure safe system operation when changes occur to the system.

The eleventh element addresses incident investigation to ascertain the causes behind incidents and develop recommendations on how to avoid them later. The twelfth is emergency planning and response in which employers put in place plans to face emergencies. The thirteenth one deals with compliance audits, through evaluating a PSM program with an implementation duration of three years at least. The last one focuses on trade secrets, which allow employers to protect their processes that are considered trade secrets.



V. HSE CAPACITY BUILDING PROGRAM

The MoP has developed the HSE Capacity Building program. This program is designed to evaluate a group of potential HSE reliable professionals who represent oil and gas segments.

The capacity building program is designed in participation with a number of international specialized companies like DNV and DuPont to utilize their experiences and help in determining the training program's content according to the most recent safety programs.

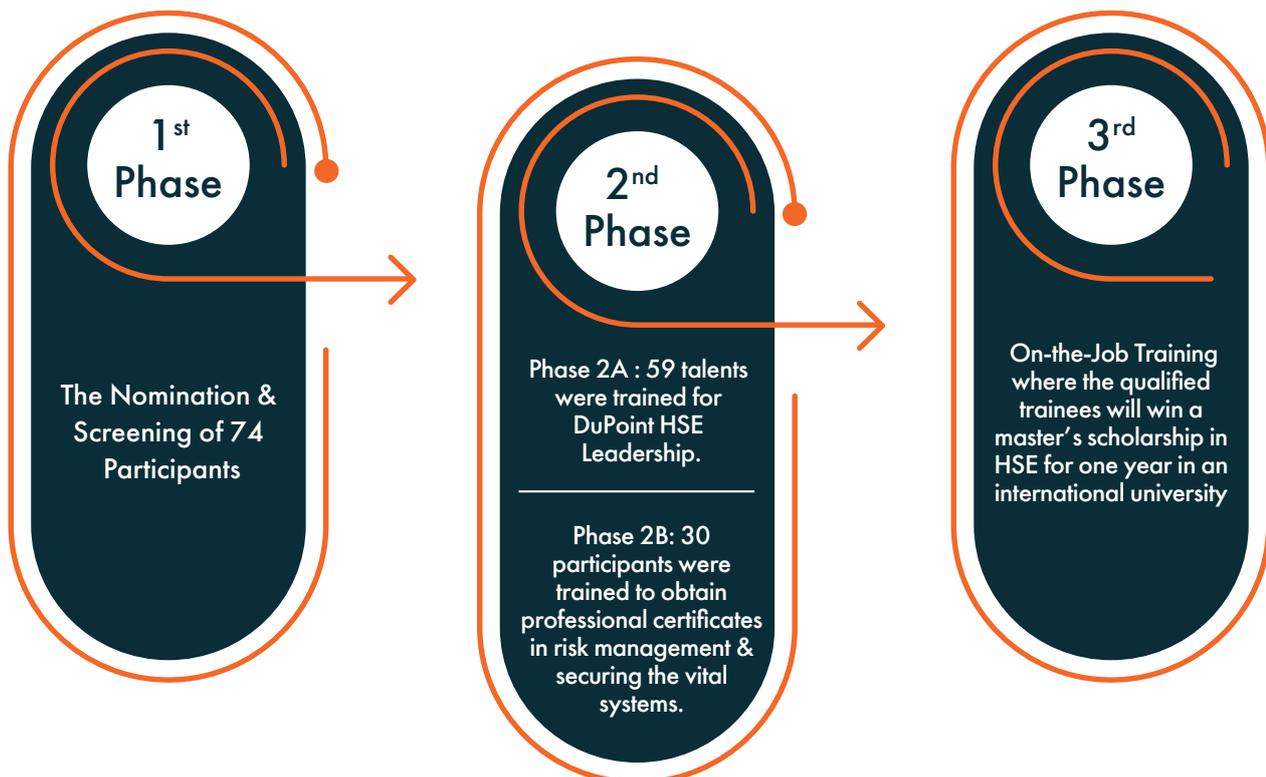
The Capacity Building Program was delivered over three phases, conducted from January to May of 2019.



Capacity Building Program Elements



Capacity Building Program Phases





THE PETROLEUM SECTOR'S SUSTAINABILITY

VI. HSE DIGITALIZATION

Some of the sector's companies utilized digitalization while applying an HSE strategy. This came in line with the MoP's directive toward digitalizing oil and gas sector.

Safety systems can leverage digital transformation through establishing a complete interactive model which includes all the sites' data and records it in a real-time 3D mapping. This optimizes the safety system, enhances productivity, improves

the quality of products, reduces operating costs, and mitigates potential hazards.

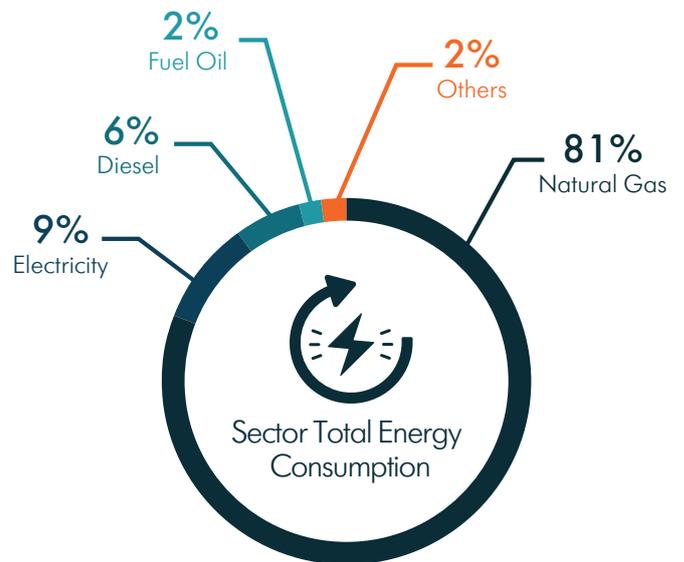
Digitalizing safety reporting was another method that was explored, where reporting systems with huge amounts of information can be turned into an electronic system to overcome different HSE problems faced while managing projects.

B. ENERGY EFFICIENCY

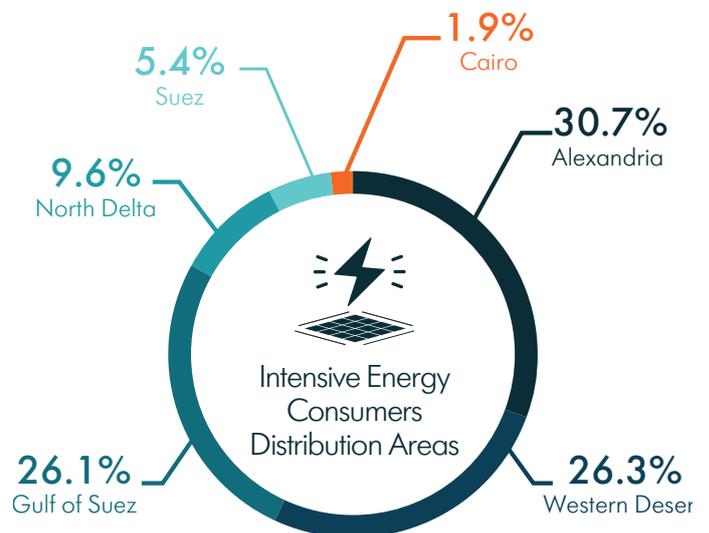
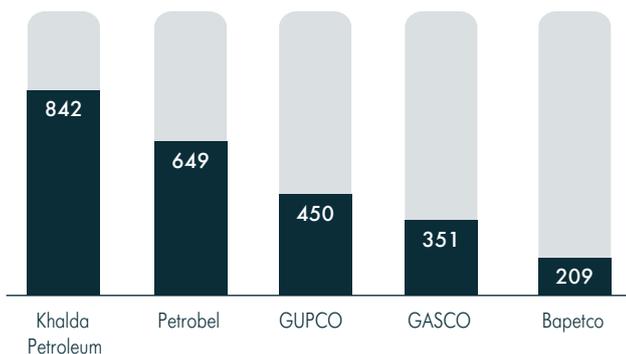
I. PETROLEUM SECTOR ENERGY CONSUMPTION BY TYPE

Energy consumption in the petroleum sector accounts to 5.23 million tons of oil equivalent (mmtoe) and is distributed between natural gas, electricity, diesel, fuel oil and others. Natural gas is the most consumed among other energy types, mainly in fired heaters, boilers and In-Situ power generation. The electricity comes next where it is consumed in electrical motors of pumps, compressors, fans and blowers.

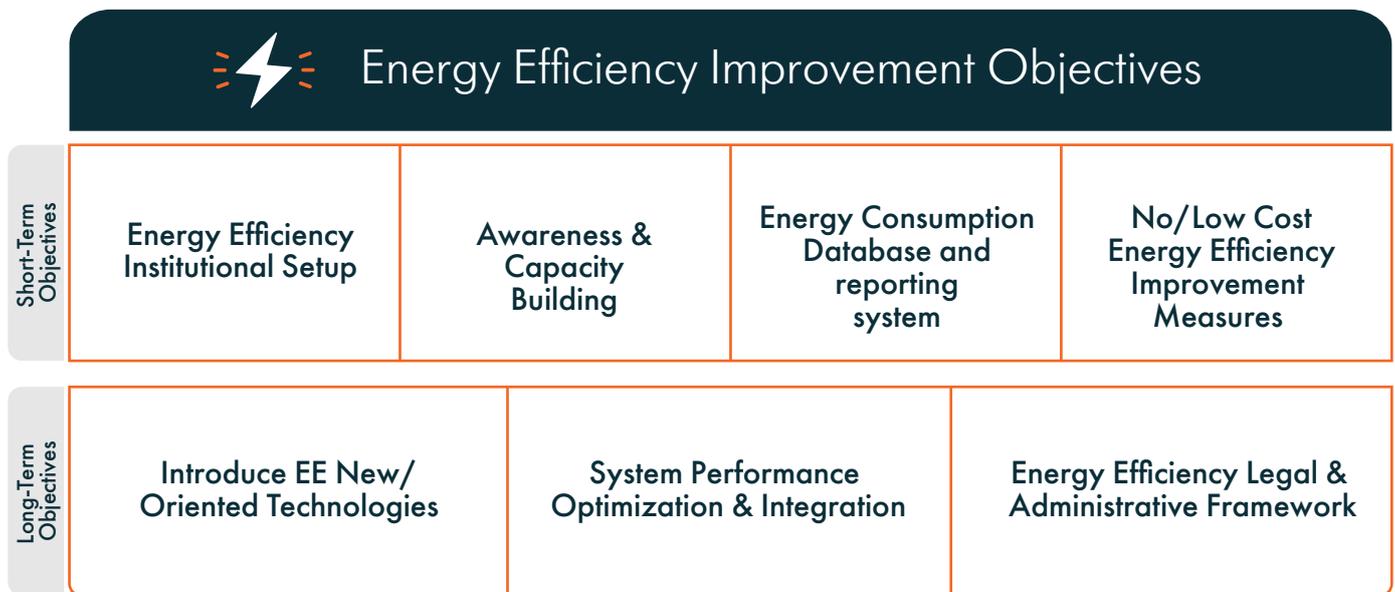
According to the petroleum sector's energy consumption 25 consumption-intensive companies consumed equivalent to around 4804 mmtoe which represent 92% of the total sector's energy. Many procedures were taken to implement low-cost projects in 13 consumption-intensive companies, which decreased consumption levels by around EGP 350 million.



The Highest 5 Intensive Energy Consumers (mmtoe)



II. ENERGY EFFICIENCY IMPROVEMENT OBJECTIVES



a. Two of the Short-term Objectives

1. Evolution of Energy Efficiency Institutional Set Up

In 2015, a Petroleum Sector Supreme Committee for energy efficiency was established. In light of the modernization project, 4-B program for energy efficiency started in 2017. In 2018, the MoP specified a division, known as “Energy Efficiency

and Climate Division” (EECD). In August 2018, EECD division was established in affiliated petroleum companies as EGPC, EGAS, Ganope, and ECHEM and others reaching 100 companies.

2. Capacity Building Programs

For capacity building, there are five programs adopted, which are top management program, site visits, conference & exhibition, APG seminars, and Front-End workshops. The MoP arranged two energy efficiency awareness workshops for more than 20 Companies and eight energy efficiency Awareness workshops for 85 companies (234 Employees attended).

The MoP also launched the First Egyptian Petroleum Sector Energy Efficiency Conference (EPEEC 2018), which was held in May 2018 at Petroleum complex in Alexandria. The Second Conference (EPEEC 2019) was held in Cairo in April 2019, under the theme “from Success to Sustainability”. The theme highlighted the importance of achieving the goals of the Modernization Project through implementing the 4-B program.

THE PETROLEUM SECTOR'S SUSTAINABILITY

b. One the Long-term Objectives

1. Energy Efficiency Long-Term Training Plan

The energy efficiency long term training plan started to be implemented in November 2018. The plan is composed of 15 Energy Efficiency programs, 1115 planned trainees (from Energy Efficiency, Operation and Maintenance Units), technical programs (covering most of the existing energy efficiency technologies) and Energy Management (through basic energy management programs).

Since then, 64 programs were organized. In light of the programs, 20 energy managers were certified by the Association of Energy Engineers (AEE) while 23 were certified by the Regional Center for Renewable Energy and Energy Efficiency (RECREEE).

III. MEDIUM & HIGH COST PROJECTS FOR ENERGY EFFICIENCY

On the sidelines of achieving energy efficiency, six medium and high cost projects took place. The European Bank for Reconstruction and Development (EBRD) has supported energy efficiency projects in SOPC with investments of \$250 million (EGP 4 billion, is converted using the average exchange rate of January 2020).

Furthermore, new diesel hydrotreating unit was established to produce diesel, new steam boiler, gas flaring recovery unit, waste water treatment unit. Moreover, around 860 houses in the Egyptian countryside has successfully reduced energy consumption by around 3,000 Megawatt per year (MW/Y).

As per the 4-B program, many workshops took place to spread awareness about energy efficiency. For instance, United Nations Industrial Development Organization (UNIDO) made a program for motor system optimizations, including six projects applied in six companies.

The program is composed of six training sessions at Cairo and Alexandria, in cooperation with 11 Certified "National Energy Expert" in the sector. The program's annual savings reached EGP 6 million.





Additionally, a training plan containing 68 programs was prepared to be applied in five companies over a year and a half and it is expected that the number of trainees will reach 1,100.

Moreover, many energy efficiency projects financed by the EBRD were executed in GASCO and the SOPC with investments of around \$450 million (EGP 7.2 billion). GASCO and EBRD worked on a project for energy efficiency with annual savings \$15.63 million (EGP 249 million), through applying ORC technology with total recovered power of 24.6 MW. GASCO and EBRD also succeeded in building Beni Suef new gas compression station, with investments \$200 million (EGP 3.2 billion).

With the aim of refinery optimization, EBRD and SOPC worked on a project to launch new DCU, new VRU and an asphalt unit with annual income \$ 115.5 million (EGP 1.8 billion). Additionally, a training plan containing 68 programs was prepared to be applied in five companies over a year and a half and it is expected that the number of trainees will reach 1,100.

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IV. ENERGY SAVED IN THE PETROLEUM SECTOR

As part of the 13-companies' achievements in applying no/low cost measure strategy, the energy saved in the sector recorded EGP 348 million/y.



THE PETROLEUM SECTOR'S SUSTAINABILITY

The used electricity, mixed fuel and steam also decreased by 2820 toe, 1629 toe and 450 toe respectively. Electricity decreased through applying load management for pumps and motor system optimization.

While mixed fuel decreased by optimizing the usage of refineries and petrochemical plant off-gases.

V. ENERGY EFFICIENCY STRATEGY FOR THE PETROLEUM SECTOR

The MoP and the European Commission (EC) both participated in the Technical and Financial Sustainability of the Renewable Energy and Energy Efficiency Sectors Program. Such cooperation started by establishing an EECU at the MoP through setting the operational organization, energy efficiency guidelines, standards, strategies and financing mechanism. The energy efficiency business plan for EECU was set through making a framework for the business plan, setting energy efficiency benchmarking (KPIs), and developing energy efficiency Measuring, Reporting and Verification (MRV) System.

It is important to put a capacity building plan, develop training content, focusing on identifying the needed equipment, specifications and the estimated cost necessary for the energy efficiency units.

The MoP also worked with Japan International Cooperation Agency (JICA) on capacity development on energy efficiency, through basic energy efficiency methods and specification, strategic roadmap for petroleum sector facilities and on-job training & energy audit.

For the on-job training & energy audit to be done, a training was executed and an energy audit and integration was applied, including multiple sites.

The MoP and EBRD also contributed in a program for measuring and reducing methane fugitive emissions along the national infrastructure.

The projects' tasks process starts by pilot measurement surveys, followed by reviewing and improving methane emissions by MRV and inventory, developing a viable roadmap for methane emission reduction, working on improving policies





and regulations and finally disseminating results, capacity building and supporting knowledge transfer.

The targeted companies are those working in gas upstream; processing; transportation, gas liquefaction, distribution or working as oil and gas storage farms.

VI. EGYPT-FLARE GASES MONETIZATION PROGRAM

In light of Egypt-Flare Gases Monetization Program (E-FGMP), Egypt announced that it will join the World Bank's "Zero Routine Flaring Initiatives 2030", which is a global move to reduce gas flaring at oil production sites. This was announced after the minister signed the endorsement, at the opening of the EBRD workshop in Cairo, "Ending Routine Flaring of Associated Gas in Egypt".

Such initiative was launched by the World Bank (WB) in 2015, gathering governments, institutions and oil companies, who agree that flaring is unsustainable from a resource-management and environmental perspective. Among the top 30 flaring countries, Egypt acquired the 14th rank during the period (2013-2017), according to 2017 flaring volume.

Esh El Mallaha Petroleum Company (ESHPETCO) APG Recovery Case Study stated that by recovering Associated Petroleum Gases to produce in-situ Electricity and extracting NGL, allow annual savings EGP 65 million.

E- FGMP has four modules; which are the institutional set-up, regulations and guidelines through setting MRV, data management system and project origination through defining mechanism.

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