The Ministry Of Petroleum and Mineral Resources

Egyptian Petroleum Sector

# Energy Efficiency

## Strategy 2022-2035

# Foreword by the Minister of Petroleum and Mineral Resources

As the Minster of Petroleum and Mineral Resources of the Arab Republic of Egypt, I am very pleased to release this first Egyptian Petroleum Sector Energy Efficiency Strategy 2022-2035. With this release, the Ministry of Petroleum and Mineral Resources is following through on its commitment to improve the performance of the sector, enhance the competitiveness of the business in alignment with the best industry practices while achieving the decarbonization targets to secure Egypt's energy needs through the implementation of energy efficiency measures.

This report - Egyptian Petroleum Sector Energy Efficiency Strategy 2022-2035 - is an important guide for how to improve the energy efficiency in the petroleum sector and rationalize the use of the petroleum products in Egypt. It provides guidance on the best energy efficiency measures, shows the pathway to boost the sector's productivity and competitiveness and reduce GHG emissions in line with the objectives of Egypt's vision 2030.

Egypt's social and economic development is highly dependent on the petroleum sector, with petroleum products and natural gas providing more than 94% of the energy demand and this demand will continue on the short and mid-term. Global warming and decarbonization had become top priority in our world today. Therefore, it is imperative to develop this energy efficiency strategy in order to improve the efficiency of energy utilization as the most cost-effective pathway of decarbonization and mitigate GHG emissions to achieve the national and global goals.

The Egyptian Petroleum Sector Energy Efficiency Strategy 2022-2035 introduces a two-stage approach. The first stage aims to address the barriers identified, build the needed foundations for sound energy management, develop the market for EE services and mainstream EE into the corporate culture across the sector and assess the EE potential of the major energy consumers. The second stage would upscale EE activities across the sector and implement sound energy management programs to achieve and make visible substantial energy savings. The second stage would also address the energy efficiency potential at the transport sector, which is the major liquid fuel consumer. It is to be noted that the two stages are overlapping and interdepended.

I would like to value the achievements in improving energy efficiency accomplished by the petroleum sector modernization program 4-B, the higher committee of the energy efficiency and the energy efficiency and climate department of the Ministry of Petroleum and Mineral Resources. I also would thank the EU support in the project of "Support the Technical and Financial Sustainability of the Renewable Energy and Energy Efficiency Sectors" and the component E-team of the project. I would like to encourage you all to continue your efforts to accomplish further achievements.

This first Egyptian Petroleum Sector Energy Efficiency Strategy 2022-2035 provides the tools for contributing to Egypt's future economic development and secure energy in optimum way while protecting our environment to provide a better quality of life in Egypt in the future for all our people.



**H.E. Tarek El Molla**

The Minister Of Petroleum And Mineral Resources

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## List of Acronyms & Abbreviations

| | |
|---|---|
| **AFD** | Agence Française de Développement |
| **ANRPC** | Alexandria National Refining and Petrochemical Company |
| **APC** | Alexandria Petroleum Company |
| **ASORC** | Assiut Oil Refining Company |
| **APG** | Associated Petroleum Gas |
| **BAT** | Best Available Technologies |
| **bbl** | Billion barrels |
| **Bcm** | Billion cubic metres of natural gas |
| **CFLs** | Compact Fluorescent Lights |
| **CNG** | Compressed natural gas |
| **CIB** | Commercial International Bank Egypt |
| **CGC** | Credit Guarantee Company |
| **COP** | Conference of Parties |
| **CORC** | Cairo Oil Refining Company |
| **CSP** | Concentrated Solar Power |
| **EBRD** | European Bank for Reconstruction and Development |
| **EC** | European Commission |
| **ECHEM** | Egyptian Petrochemical Holding Company |
| **EE** | Energy Efficiency |
| **EEAA** | Egyptian Environmental Affairs Agency |
| **EEAP** | Energy Efficiency Action Plan |
| **EECD** | Energy Efficiency & Climate Department within MOPMR |
| **EEIGGR** | Efficiency Improvement and Greenhouse Gas Reduction project |
| **E-FGMP** | Egypt-Flare Gases Monetization Program |
| **EGAS** | Egyptian Natural Gas Holding Company |
| **EGPC** | Egyptian General Petroleum Corporation |
| **EgyptSEFF** | Egypt Sustainable Energy Financing Facility |
| **EIA** | Environmental Impact Assessment |
| **EIB** | European Investment Bank |
| **EPC** | Energy Performance Contract |
| **EPEEC** | Petroleum Sector Energy Efficiency Conference and Exhibition |
| **ESCO** | Energy Service Company (for Energy Performance Contracting) |
| **GANOPE** | South Valley Egyptian Petroleum Holding Company |
| **GASCO** | Egyptian Natural Gas Company |
| **GCF** | Global Climate Fund |
| **GDP** | Gross Domestic Product |
| **GEF** | Global Environmental Facility |
| **GEFF** | Green Environment Financing Facility |

| | |
|---|---|
| **GHG** | Greenhouse gas |
| **GTL** | Gas-to-liquids |
| **HEC** | High Energy Committee |
| **IEE** | Industrial Energy Efficiency |
| **IEA** | International Energy Agency |
| **ISES** | Integrated Sustainable Energy Strategy |
| **IOCs** | International Oil Companies |
| **ISO** | International Standards Organisation |
| **JICA** | Japan International Cooperation Agency |
| **KPI** | Key Performance Indicator |
| **KTOE** | Kilotonnes of oil equivalent |
| **LCC** | Life Cycle Cost |
| **LNG** | Liquefied Natural Gas |
| **MEPS** | Minimum Energy Performance Standards |
| **MoERE** | Ministry of Electricity and Renewable Energy |
| **MOPCO** | Misr Fertilizers production Company |
| **MoPMR** | Ministry of Petroleum and Mineral Resources |
| **MoT** | Ministry of Transport |
| **MRV** | Monitoring, Verification and Reporting |
| **MTOE** | Million tonnes of oil equivalent |
| **MW** | Mega Watt |
| **MWH** | Mega Watt Hours |
| **NDC** | Nationally determined contribution |
| **NGL** | Natural gas Liquids |
| **NPC** | Nasr Petroleum Company |
| **NREA** | New and Renewable Energy Authority |
| **PV** | Photovoltaic |
| **SEC** | Supreme Energy Council of Egypt |
| **SESE** | Sustainable Energy Strategy for Egypt |
| **SIDPEC** | Sidi Kerir petrochemicals Company |
| **SOPC** | Suez Oil Processing Company |
| **SWOT** | Strengths, Weaknesses, Opportunities, Threads |
| **TCF** | Trillion cubic feet |
| **TMD** | Transportation, Midstream and Downstream |
| **TOE** | Tonnes of oil equivalent |
| **VOC** | Volatile Organic Compounds |
| **UNIDO** | United Nations Industrial Development Organization |
| **UNDP** | United Nations Development Programme |
| **USD** | United States Dollar |
| **USTDA** | US Trade and Development Agency |

# EXECUTIVE SUMMARY

## Importance and need for EE strategy

The petroleum sector is considered as the main locomotive for social and economic development in Egypt. It provides more than 94% of Egypt's total primary energy. The recent developments in the sector necessitate the development of an Energy Efficiency (EE) Strategy to tackle several challenges including escalating energy demand, declining domestic oil production and exports, subsidized prices and the need for decarbonization, and reduce substantial amounts of gas flaring. Thus, improving energy efficiency would improve the sector's productivity and competitiveness and reduce GHG emissions in line with the objectives of Egypt's vision 2030.

## Strategy development approach: A two-stage approach

The strategy was developed using a participatory approach, as development process was supported by a consulting team from DAI under the EU-funded project 'Support the Technical and Financial Sustainability of the Renewable Energy and Energy Efficiency Sectors' with extensive consultation with EECD/MoPMR, and the major stakeholders in the sector (EGPC, EGAS, GANOPE, ECHEM and affiliated companies). Existing barriers of EE were identified and prioritized using a questionnaire that was designed and circulated to the stakeholders. A SWOT analysis was conducted to assess the sector's competitive positions as related to EE, and identify internal and external factors that might affect development and implementation of the strategy.

Based on the assessment of the baseline situation, a two-stage approach was adopted. The first stage aims to address the barriers identified, build the needed foundations for sound energy management, develop the market for EE services and mainstream EE into the corporate culture across the sector, and assess the EE potential of the major energy consumers. The second stage would, upscale EE activities across the sector and implement sound energy management programs to achieve and make visible substantial energy savings. The second stage would also address the energy efficiency potential at the transport sector, which is the major liquid fuel consumer. It is to be noted that the two stages are overlapping and interdepended.

## Challenges that emphasize the importance of developing an energy efficiency strategy

Egypt's social and economic development is highly dependent on the petroleum sector, with petroleum products and natural gas providing more than 94% of the energy demand. The energy landscape during the past few decades has been characterized by the emergence of many challenges that require the importance of preparing and developing an energy efficiency strategy, including: (1) The escalation of demand for energy, which has almost doubled during the past decade, which consequently led to an increase in carbon dioxide emissions to nearly double, (2) Increasing levels of oil consumption compared to its production, which led to an increase in its imports, (3) subsidies for petroleum products and natural gas prices, (5) Increasing gas flaring quantities, which were estimated at 2.36 billion cubic meters In 2020, representing about 1.7% of the total gas flaring in the world and about 3.6% of the total natural gas production in Egypt during the same year(GGFR satellite date), (6) relying heavily on oil and natural gas for electricity generation.

Therefore, it is imperative to develop the current energy efficiency strategy in order to improve the efficiency of energy utilization and mitigate GHG emissions.

## Existing EE targets, strategies, policy, and programmes

The National "Sustainable Energy Strategy for Egypt to year 2035" (SESE 2035) was approved by the Supreme Energy Council of Egypt" (SEC) in October 2016. The quantitative objective of the SESE 2035 includes achieving 20 million-ton-oil equivalent savings in the year 2035. This will represent 18% of the energy consumption in the year 2035 through focusing on three main sectors which include: building, industrial and transportation sectors.

In 2016, the Oil and Gas Modernization Program was launched. This program has envisioned multiple components to improve energy efficiency in the petroleum sector to optimize energy consumption and costs, these components are: a) Develop energy efficiency Departments in all affiliated companies, b) Increase awareness for the importance of reducing energy consumption, c) Establish energy database & monitoring systems, d) Implement low cost/ no cost and housekeeping energy efficiency measures, e) Introduce EE technologies to reduce cost and improve products yield, f) Systems optimization and integration to reduce energy consumption and operating costs and g) Develop energy efficiency legal & regulatory framework.

Gas flaring is a source of local pollution, GHG emissions, and a waste of a valuable natural source. According to GGFR satellite data in 2020, Egypt ranks 13th among the top gas-flaring countries in the world. Capturing the over two billion cubic meters of gas flared in the country could provide five per cent of national energy needs. Reduction of gas flaring is among the climate change mitigation opportunities raised by Egypt in the context of the COP21 in Paris. The MoPMR had formulated a committee responsible for monitoring the gas flaring and promoting reduction projects. Furthermore, in cooperation with EBRD, the MoPMR had prepared a standard Measurement, Reporting and Verification (MRV) methodology for gas flaring.

As part of the sector's modernization program several EE initiatives has been implemented as follows:

- Low-cost EE projects were implemented in 31 of the major consuming companies that resulted in an annual saving of nearly EGP 812 million, and an annual reduction of 300 Kton of CO2.
- Currently, several affiliated companies are implementing or have completed some medium and high-cost EE projects.

It is to be noted that the currently underway and planned EE activities across the sector would be integrated under the umbrella of this EE sector's strategy.

## Barriers to energy efficiency in the sector

The market for EE services in the petroleum sector is at its early stages although significant efforts have and are being made by EECD and donors to implement energy audits, EE projects, training and awareness programs. However, typical barriers to EE still exist. These include Institutional and governance barriers, Legal and regulatory barriers, Financial and pricing barriers, and market barriers. One of the two strategic objectives of this strategy is to stipulate policy measures to remove these barriers.

## Strategic Vision

The Strategic Vision of the EE Strategy 2022-2035 is:

***"Support the economic improvement of energy efficiency in the petroleum sector while meeting the sustainability objectives of Egypt's vision 2030 and contributing to energy security and decarbonization."***

## Main strategic objectives and targets

The EE Strategy is divided into two interdependent, progressive, and overlapping stages. Ongoing and planned EE projects would be integrated under this framework to achieve the strategic targets. Measures identified in the strategy can be rescheduled during the Master Plan implementation if needed.

***Stage I (2022-2027)***

The objective is to overcome the EE barriers in order for the EE market to be more matured, EE capacities will be strengthened and the enabling environment becomes more favorable to EE projects. The target for Stage I is to achieve 10 % energy saving by 2027 from 2021 level.

***Stage II (2025-2035)***

As the market for EE will become more mature, the legal and institutional framework developed, and the EE capacities strengthened, potential of energy saving would be identified and larger energy savings can be achieved. The target for this Stage is to achieve energy savings of 18% of 2035 energy consumption level (the national target).

## Energy efficiency goals

To achieve the two strategic objectives and targets, the following policy goals are identified:

**Goals of Stage I**

- Develop the legal/regulatory and institutional framework
- Building the Capacity of EECD, holding companies, and affiliated companies
- Raise Energy Efficiency awareness
- Develop EE financing schemes
- Identify Energy saving potential
- Realize the full potential of low-cost EE opportunities across the sector

35 EE policy measures are identified to achieve the goals of Stage I.

**Goals of Stage II**

- Promote EE in processes and equipment
- Benchmark major energy consumers against industry standards
- Minimizing gas venting and routine flaring.
- Improve EE in road transport (MoERE and the MoT will lead the implementation).
- Harness the potential of RE across the sector

13 policy measures are identified to achieve the goals of Stage II.

## Monitoring Process

The process of monitoring the progress of implementations of the Strategy will comprise the following:

1) A regulatory instrument (Ministerial Decree) will be issued to give power to EECD, EGPC, and the Holding Companies to monitor the progress of implementation of the measures identified in the Strategy and Master Plan and to mandate the affiliated entities to improve their EE and contribute to achieving the sector's EE targets.
2) The EECD will be the responsible institution for monitoring and evaluation of the progress of implementation of the Strategy and the Master Plan.
3) Activities for monitoring and evaluation will be reported annually to the High Energy Committee using the harmonized reporting system (Measure #2), potential deviations and corrective measures taken will be identified, if any.
4) The harmonized reporting system will identify the parameters to be monitored and their frequency of monitoring.
5) Annual Monitoring and evaluation reports will be uploaded in the information system (Measure #11)
6) The High Energy Committee will serve as one of the evaluation bodies (the other being EECD) , make annual assessment of the level of implementations of different measures and make necessary corrections/amendments of the action plan as it deems necessary.
7) A summary of the progress report of the action plan will be uploaded to EECD website (Measure #14) and disclosed to all the stakeholder every year.
8) Indicator-based monitoring is one of the most effective forms of monitoring and evaluation. Indicators are valuable tools for tracking progress on measures implementation and achievement of targets. Outputs and performance indicators (Measure # 12) for all the measures will be identified in the action plan.

# 1. Background

Energy drives the modern world and powers modern lives and is constantly involved in everyday human activities. Indeed, energy has become the backbone to every nation's economic growth and social advancement. Egypt is not an exception.

Generally, a national or sectorial energy efficiency strategy is a set of informed and integrated guiding measures that aim at the achievement of the panoramic vision outlining how a country or a sector is going to face its energy efficiency challenges for the years to come. This energy efficiency strategy entails that energy efficiency has to come firstly by creating or expanding the market and the capacities by building or improving the institutional, legal and regulatory framework and addressing the barriers to energy efficiency. In parallel, awareness and networking are strong tools which should be used continuously. The second step includes the implementation of sound energy management programmes across the sector to achieve and make visible substantial energy savings.

The EE Strategy is part of a Low Carbon Strategy of the petroleum sector. The Low Carbon Strategy will be developed during the coming period. It is a prerequisite for financing of low carbon activities by international financing and development institutions.

# 2. Importance and need for EE Strategy

The petroleum sector is considered as the main locomotive for social and economic development in Egypt. It provides more than 94% of Egypt's total primary energy consumption in the year 2019 (as oil products and natural gas) compared to 3% for hydroelectricity, 2% for coal and about 1% for renewable[1]. Meanwhile, it also consumes natural gas and oil products in performing various actives within each of its sub-sectors and accordingly contributes to GHG emissions. The recent developments in the petroleum sector of Egypt necessitate the development of an EE Strategy to tackle the existing challenges. The outlook of the petroleum sector highlights several challenges of the sector among of which are the following: (1) the escalating energy demand, (2) declining oil production in exchange for increased consumption, (3) increased crude oil and oil products imports and declining of exports, (4) natural gas exports and imports trend, (5) increased oil and natural gas subsidies, (6) substantial amounts of gas flaring, and (7) heavily reliance on oil and natural gas for electricity generation[2].

Furthermore, the EE has considerable benefits for the sector which Egypt should fully exploit including: (1) the contribution to the security of energy supply and ensure sustainability, (2) increase reliability of energy supply, (3) create markets for EE and bring on new investments, (4) improve productivity and create new jobs, (5) lower operating costs, (6) increase the competitiveness and reduce environmental impacts, (7) extend the lifetime of the finite and depleted natural gas and oil resources and help to keep energy affordable for consumers by lowering investment and operating costs for harnessing new energy sources to meet rising demand.

Therefore, it is imperative to develop the current energy efficiency strategy in order to improve the efficiency of energy utilization and mitigate GHG emissions.

[1] Based on the MoP and MoERE data

[2] Based on the MoP, MoERE, IEA and the WB data.

# 3. Strategy development approach

The strategy was developed in using a participatory approach. The development process was carried out by a consulting team from DAI under the EU-funded project 'Support the Technical and Financial Sustainability of the Renewable Energy and Energy Efficiency Sectors'. Extensive consultation with EECD/MoPMR, and the stakeholders (EGPC, EGAS, GANOPE, ECHEM and affiliated companies) was realized in order to take into account their views and secure their ownership. Data needed to develop the strategy were identified and collected. Data sources included those received from EECD/MoPMR and the Holding Companies, data collected from international organizations, such as IEA, and published reports. A second step was a literature review of reports, laws, decrees, concessions agreements, Egypt's vision 2030, Egypt's national sustainable energy strategy 2035, Egypt's National EE strategy and action plans, Egypt's national communication reports, and Egypt's Nationally determined contributions (NDC). A questionnaire was designed and circulated to stakeholders to identify and prioritize barriers of EE. A SWOT analysis was also conducted to assess the petroleum sector's competitive positions as related to EE, and identify internal and external factors that might affect development and implementation of the strategy.

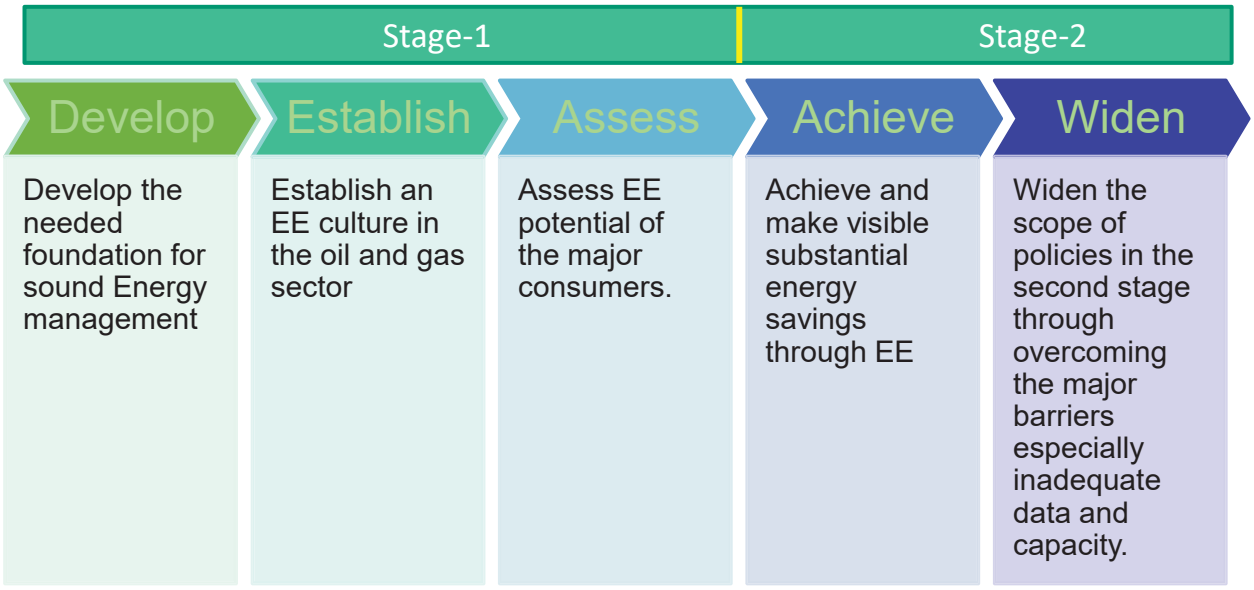



**Figure 1: Two-stage approach for the EE Strategy**

Based on the assessment of the baseline situation, a two-stage approach was adopted, in consultation with the stakeholders. Especially, the participation of MoPMR and the stakeholders was realized through a focus group meeting where all voices were heard and feedback from the stakeholders on the proposed measures was received by the consultant's team. As regards the two-stage approach, the first stage aims to address all barriers to EE in order to develop the needed foundations for sound energy management, establish the market for EE services and an EE culture in the petroleum sector, and assess the EE potential of the major energy consumers. After overcoming the major EE barriers, the second stage would, implement sound energy management programs across the sector to achieve and make visible substantial energy savings. The second stage would also address the energy efficiency potential at the transport sector, which is the major liquid fuel consumer.

# 4. The baseline case

## 4.1. Energy Profile of Petroleum Sector

Egypt's economic activities rely heavily of the petroleum sector since oil products and natural gas provide more than 94% of the energy demand of the country. Therefore, the petroleum sector is one of the most important sectors in terms of economics and sustainability. However, the sector faces several challenges which are highlighted below.

### 4.1.1. Petroleum sector main challenges

**1. The escalating energy demand**

**T**he last decade, the period (2009-2021) has witnessed an escalating energy demand which resulted in almost doubling Egypt's primary energy consumption and $CO_2$ emissions. Primary energy consumption has increased from 48.6 MTOE in 2000 to 92.8 MTOE in 2019 and $CO_2$ emissions from 119 million tons in 2000 to 217 million tons in 2019 combined with the existence of oil and natural gas proven reserves (3.1 billion bbl for oil and 75.5 TCF for natural gas) in 2019[3].

**2. Declining oil production in exchange for increased consumption**

Oil production and consumption during the period 2010-2021 were characterized by the following main features: (a) decline rate of oil production during that period; (2016-2021) compared to an annual growth rate for oil consumption during the same period. (b) Till the year 2019-2020 oil export levels had exceeded that for oil import.

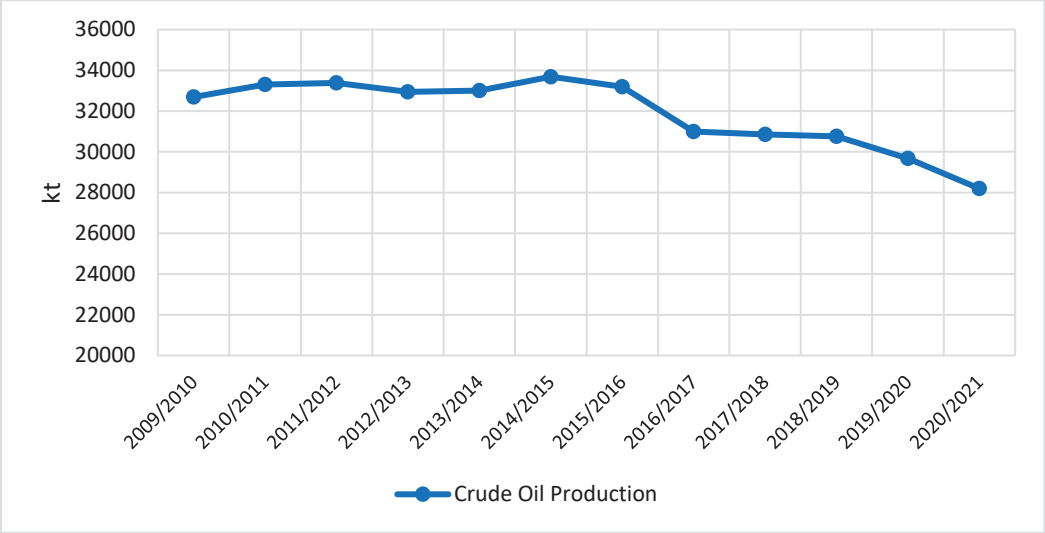



**Figure 2: Crude Oil Production rate kt (2009-2021)**

**3. Increased oil imports and declining exports:** the decline of oil production in exchange for increased consumption resulted in the increase of crude oil and oil products imports and the decrease of their exports; (figures 3)

[3] EIA

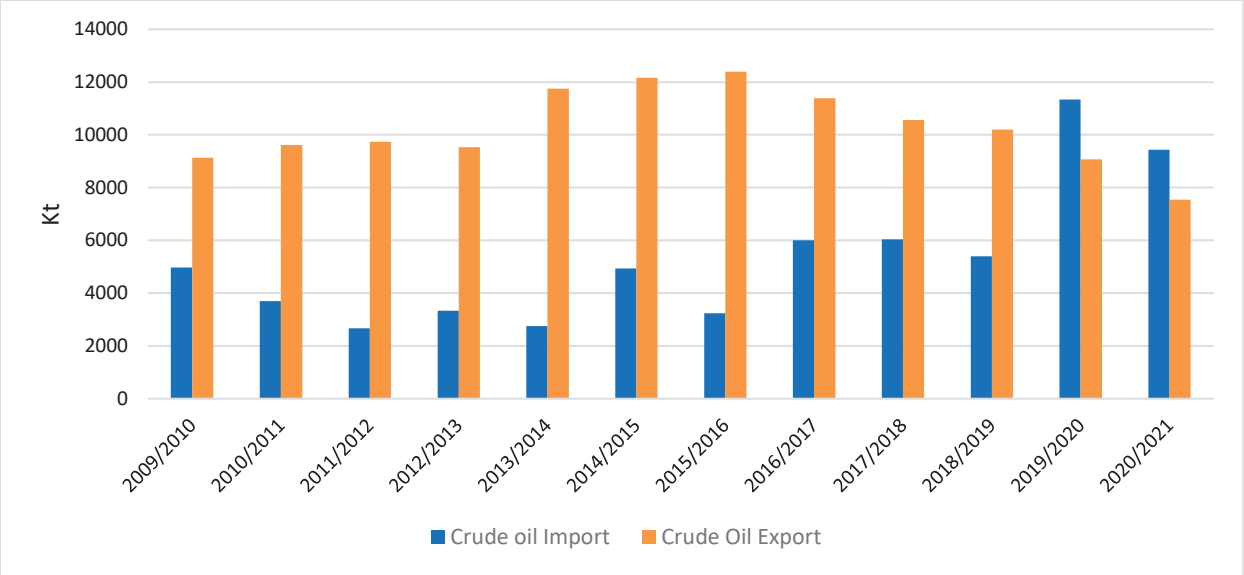



**Figure 3 Crude oil imports and exports kt (2009-2021)**

**4. Natural gas exports and imports Trend:** Till the year 2014 natural gas production levels exceeded that of consumption resulting in excess quantities available for export. Starting the year 2015, natural gas consumption exceeded production levels which led to a deficit of its supply and consequently need for its imports that reached more than 7.4 million tonnes in 2016. The new natural gas discoveries and field's developments in the eastern Mediterranean region led to the recovery and increase of natural gas production levels again; although it remained under that of consumption till the year 2018 when it started to over peak and exceed it again leading to surplus quantities for exports which accounted for more than 4.8 million tonnes in 2021.

The MoPMR started the ambitious plan to turn Egypt to a hub for Energy Trading. The MoPMR is importing the natural gas through pipelines and liquefied it using the existing gas infrastructure and export the gas to the global market.

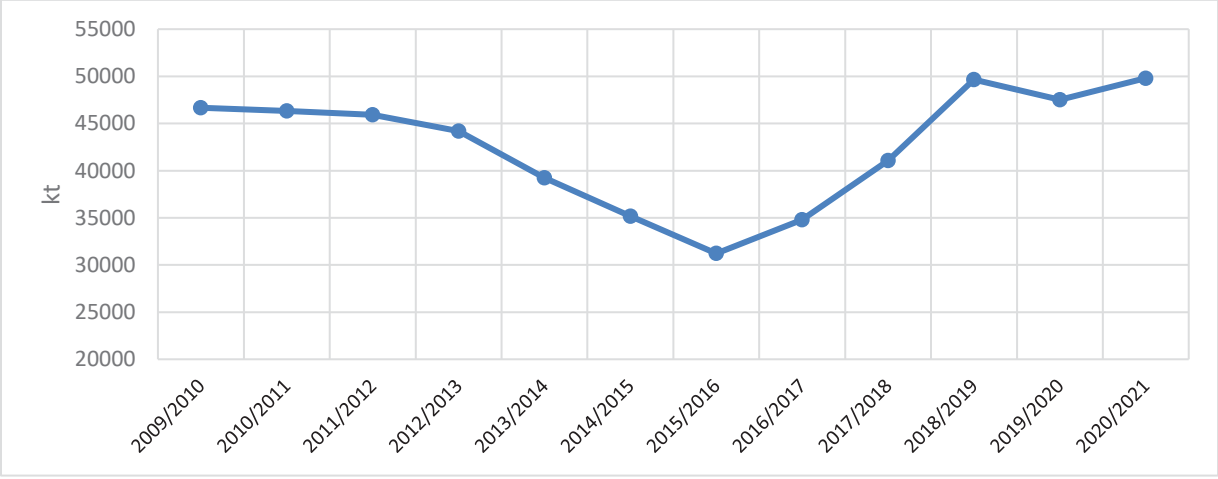



**Figure 4: Natural gas production (2009-2021)**[4]

[4] MoPMR Data

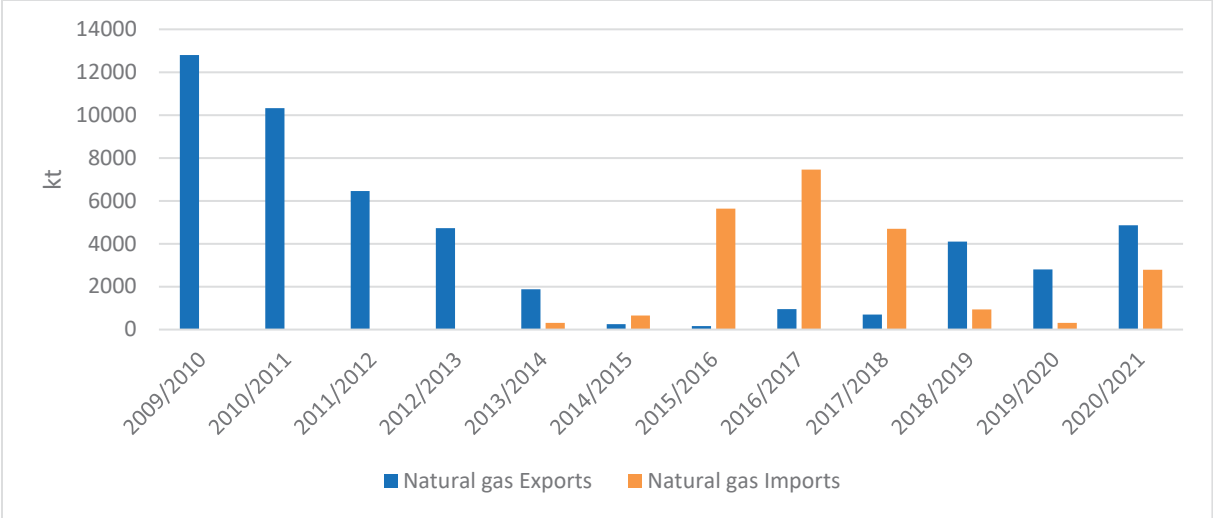



**Figure 5: Natural Gas imports and exports (2009-2021)[5]**

**5. Oil and gas subsidies:** Despite energy price reform program which started in 2014 increased energy subsidies accounted for $15.838 billion in 2019 compared to $12.233 billion in 2015. Oil products and natural gas represented 60% ($9.503 billion) of total energy subsides in 2019 compared to 40% ($6.335 billion) for electricity[6].

**6. Substantial amounts of gas flaring**: according to GGFR satellite data, In the year 2020, Egypt ranked number 13th of top gas flaring countries worldwide with total gas flared volumes estimated at 2.36 Bcm representing about 1.7% of world total gas flared and about 3.6% of total natural gas production in Egypt[7]. An average gas flared during the last 4 years accounted for 2.4 Bcm which resulted in about 5 million tons of $CO_2$[8].

**7. Heavily reliance on oil and natural gas for electricity generation:** oil and natural gas fueled power stations represented more than 91% of total electricity generation installed capacity in 2018/2019 with power plants connected to gas grid accounted for 94.7%. During the same year electricity sector total fuel consumed in power plants accounted for about 34.8 MTOE of which 2.5 MTOE as fuel oil, 0.054 MTOE as diesel and about 32 MTOE as natural gas representing 92% of total fuel consumed.

### 4.1.2. Petroleum sector total energy consumption disaggregated by various sub-sectors and energy types

The total energy consumption of the petroleum sector in 2021 is disaggregated by sub-sectors and energy types. As shown from table 1 and figures 6 and 7:

- Petroleum sector total energy consumption in the year 2021 estimated at 7.12 MTOE representing 7.8% of Egypt's total energy consumption during the same year which is 91.25 MTOE.

[5] MoPMR

[6] EGPC

[7] World Bank, Gas Flaring Initiative data

[8] World Bank, Global Gas Flaring Report 2021

- The upstream segment is considered as the largest petroleum sector energy consumer. Its energy consumption accounted for 2.52 MTOE in 2021 representing 35.4% of total petroleum sector energy consumption during that year followed by Gas Industry of 1.78 MTOE and 25.1% share, the oil refining 1.44 MTOE and 20.2% share, the petrochemicals 1.26 MTOE and 17.7 share %, then the transportation-midstream-downstream and the services & engineering segments of about 0.033 MTOE and about 0.5% share for each and finally the other segment of only 0.114 MTOE and minor share of only 1.6%.
- The first four segments (the upstream, the gas processing, the oil refining, and the petrochemicals) represent about 98.5% of total petroleum sector energy consumption.

From energy consumption pattern perspective, natural gas is the major fuel consumed by the petroleum sector in the year 2021; of about 5.24 MTOE and 73.7% share followed by diesel fuel of 0.357 MTOE and 5.0% share, electricity of 0.203 MTOE and 2.9% share, with off-gas (gases produced on-site as a result of the nature of processing facilities) and Associated Petroleum Gas (APG) accounted for 0.478 MTOE and 0.695 MTOE with shares of 6.7% and 9.8% of total petroleum energy consumption and use respectively. Accordingly, the off- gas and the APG represented together 16.5% of total petroleum energy consumption and use in the year 2021 reflecting the efforts of the MoPMR to re-use these gases instead of flaring.

| Activity | Natural Gas KTOE | APG KTOE | Off-Gases KTOE | Diesel KTOE | Electricity KTOE | Fuel Oil KTOE | Total By Sub Sector KTOE |
|---|---|---|---|---|---|---|---|
| Gas Production, Processing & Liquefaction | 1760 | | | 0.5 | 23.9 | | 1784.4 |
| Petrochemicals | 1060 | | 171 | | 27.6 | | 1258.6 |
| Oil & Gas Production | 1540 | 695 | | 263 | 22.1 | | 2520.1 |
| Refineries | 874 | | 307 | 9.3 | 109 | 141 | 1440.3 |
| Transportation & handling, Midstream and Services | 9.2 | | | 84.6 | 20.3 | | 114.1 |
| **Total By Energy Carrier** | **5243.2** | **695** | **478** | **357.4** | **202.9** | **141** | |

**Table 1: Petroleum sector total energy consumption by sub-sectors' share and Energy Carrier 2021 (KTOE)[9]**

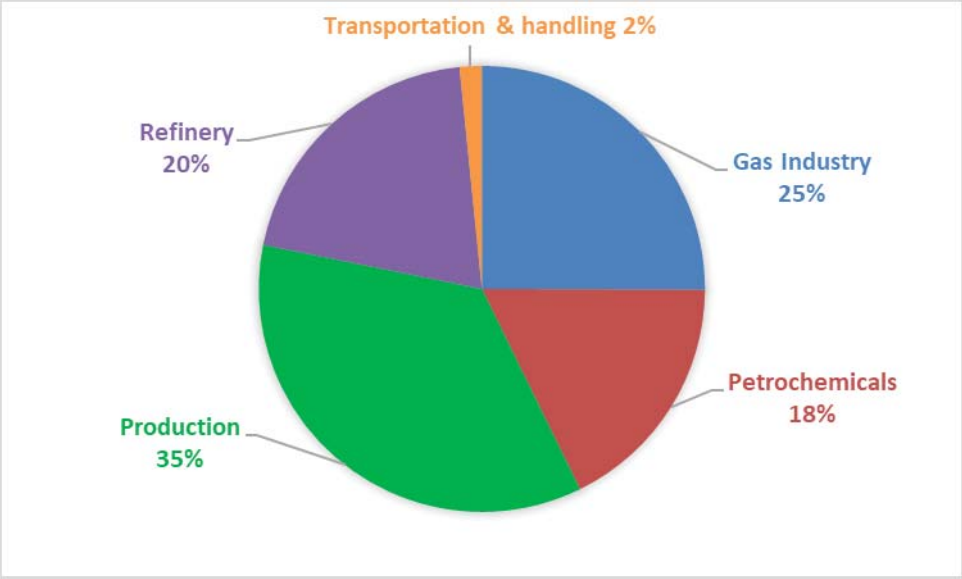



**Figure 6: Petroleum sector total energy consumption by segments share 2021[10]**

[9] MoPMR

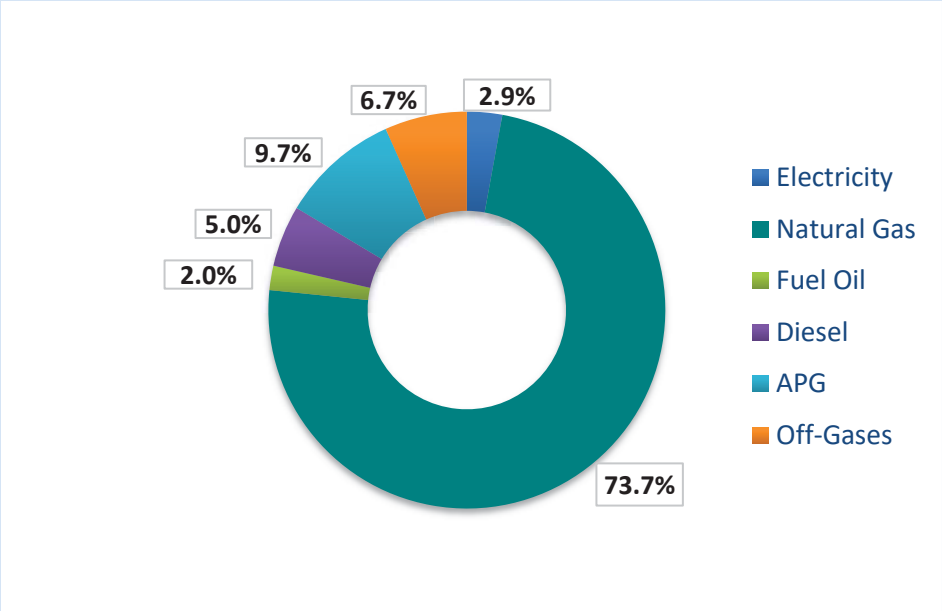



**Figure 7: Petroleum sector total energy consumption by energy carrier 2021**[10]

### 4.1.3. Energy types share of total consumption of various sub-sector in 2021

As shown also from figure 8,

- Natural gas: represented the largest share of energy consumed by the various petroleum sub-sectors in 2021 with relative shares among the various segments ranging between 8% (in the transportation & services sub-sector) to 98.6% (in the Gas Industry). The share of natural gas of total energy consumed by others sub-sector is 84.2% for the petrochemicals, 60.7% for the oil refining and 8% for the transportation & services segment.
- Electricity: its share of total energy consumed by various sub-sectors is ranging between 1.3% (in the gas processing) to 17.8% (in the transportation & services sub-sector). The share of total energy consumed by the rest of sub-sectors is 7.6% for oil refining, 2.2% for petrochemicals, and 0.9% for the upstream
- Diesel oil: its share of total energy consumed by various sub-sectors is ranging between 0.6% (in refineries) to 74.2% (in the transportation & services) its share is 10.4% for the Upstream oil and gas production.
- Fuel oil: it is mainly used in the oil refining sector with a share of 9.8% of total energy types consumed by that sub-sector in 2021.
- APG: the main and only sub-sector that utilizes APG is the upstream (27.6% of total energy consumed in 2021).
- Off- gas: its share of total energy consumed by petrochemicals and refineries sub-sectors is ranging between 21.3% for the Refineries and 13.6% for the Petrochemicals.

It should be mentioned that the level of consumption of various energy types reflects the nature of each sub-sectors, the existing processes, performed activities, utilized equipment's and technologies and its energy efficiency, the nature of products or the services provided, etc.

[10] MoPMR

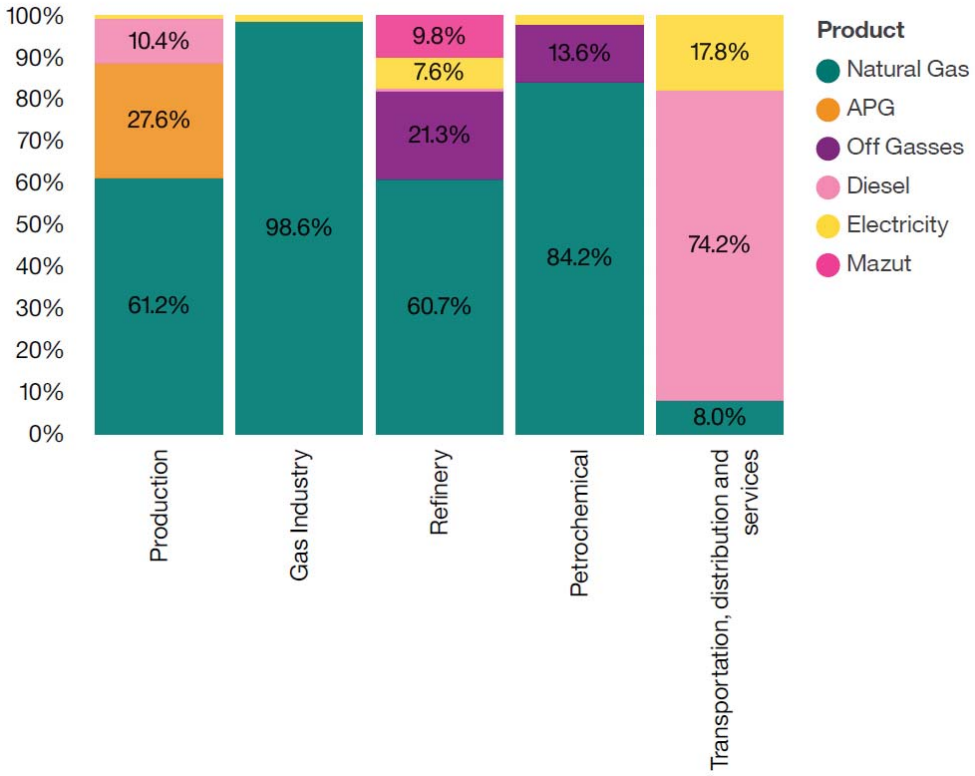



**Figure 8: Petroleum sub-sectors energy consumption by type share in 2021**[11]

## 4.2. Existing EE targets, strategies, policies and programmes

### 4.2.1. The "Sustainable Energy Strategy for Egypt to year 2035"

The National "Sustainable Energy Strategy for Egypt to year 2035" (SESE 2035) was approved by the Supreme Energy Council of Egypt" (SEC) in October 2016. The Council approved the scenario 4-b "the least cost scenario "to be the reference scenario for energy planning in Egypt in the coming years. The SESE 2035 contains an energy efficiency component that aims to:

- Capture EE multiple benefits,
- Contributes to energy security,
- Decouple economic growth from energy demand increase,
- Support Egypt to play a leading role in the MENA region, as a supplier for the energy efficiency technologies and services.

The quantitative objective of the SESE 2035 includes achieving 20 million-ton-oil equivalent savings in the year 2035). This will represent 18% of the forecasted energy consumption in the year 2035 through focusing on three main sectors which include: building, industrial and transportation sectors. In 2022, Egypt is updating the strategy to 2040 and develop new scenarios including production and use of hydrogen.

[11] MoPMR, own elaboration

### 4.2.2. The Petroleum Sector Modernization Programme

In 2016, the Oil and Gas Modernization Programme was launched, in which the "4B" component was dedicated to improving energy efficiency in the petroleum sector. This programme has envisioned multiple components to improve energy efficiency in the petroleum sector to optimize energy consumption and costs, these components are:

- Develop energy efficiency Departments in all affiliated companies.
- Increase awareness for the importance of reducing energy consumption,
- Establish energy database & monitoring systems,
- Implement low cost/ no cost and housekeeping energy efficiency measures,
- Introduce EE technologies to reduce cost and improve products yield,
- Systems optimization and integration to reduce energy consumption and operating costs,
- Develop energy efficiency legal & regulatory framework.

### 4.2.3. Associated Petroleum Gases Monetization Project

Gas flaring is a source of local pollution, global warming, and a waste of a valuable fuel source. Egypt ranks 13th among the top gas-flaring countries in the world (according to GGFR satellite data). Egypt endorsed the World Bank initiative "Zero Routine Flaring by 2030" in 2018.

It is worth to note that reduction of gas flaring is among the climate change mitigation opportunities raised by Egypt in the context of the COP21 in Paris, and energy efficiency and flaring reduction in the petroleum sector were announced in Egypt's Nationally Determined Contributions (NDC) under the Climate Convention12. For gas flaring, Egypt does not have a well-specified, regulatory framework that focusses specifically on gas flaring. The MoPMR had formulated a committee responsible for monitoring the gas flaring and promoting reduction projects. Furthermore, in cooperation with EBRD, the MoPMR had prepared a standard Measurement, Reporting and Verification (MRV) methodology with the main guidelines to monitor the amount of gas flaring. A report produced titled "Gas Flaring Reduction in Egypt"[13] was launched in 2017 providing policy recommendations to manage and minimize APG flaring.

Despite the past and current projects for gas flaring, there is still the need for installing measurement instruments to accurately account the gas flared to overcome the high uncertainty of the satellite estimated data.

### 4.2.4. Past, current, and planned EE activities

As part of the sector's modernization program several EE initiatives has been implemented as follows:

- Energy consumption in the petroleum sector accounts to 7.12 million tonnes of oil equivalent. About 97 % of the total energy consumption is being consumed by 30 significant energy consuming companies. Low-cost EE projects were implemented in 31 companies that resulted in an annual saving of more than EGP 800 million, and an annual reduction of 480 Kton of CO2. These low-cost measures include load management, combustion efficiency improvements, motor system optimization, loss reduction in steam systems, flare gases recovery projects and optimization of use of off-gases.
- Currently, several affiliated companies are implementing or have completed some medium and high-cost EE projects as exhibited in (table 4).

[12] EEAA, Egypt's Intended Nationally Determined Contributions INDC, 2015

[13] Economic Consulting Associates, "APG flaring in Egypt: Addressing Regulatory Constraints" (2017)

- The European Union is supporting the MoPMR to conduct 4 energy efficiency audits in Assiut oil refining Company, Egyptian Petrochemical Company and two upstream companies: the General Petroleum Company and Gulf of Suez Petroleum Company. Moreover, MoPMR is conducting a comprehensive capacity building program for more than 290 engineers and technicians on the energy efficiency measures and techniques with the support of the EU.
- The MoPMR is spreading the energy efficiency culture through organizing the energy efficiency conference and exhibition on annual basis. During the third conference in 2022, the MoPMR launched the first “EE excellence Award” to recognize the best EE projects and achievements implemented in the sector.
- Japan International Cooperation Agency (JICA) is supporting EECD to conduct EE audit in Cairo Oil Refining Company (CORC), drafting EE Policy and develop an EE manual and Standard Operating Procedures.
- The petroleum sector had begun its EE activities in 2013 to improve EE at administration buildings. 18 PV projects had been implemented with capacity of 1443 $KW_p$. Three solar heaters were installed and 7,000 inefficient lamps were replaced by led technology.
- The MoPMR is currently establishing the “Center of Excellence for EE and Process Optimization”. In Feb 2022, two of the affiliated companies in the petroleum sector signed MOU for establishing the center. The center will provide full-fledged services for all the energy sectors including petroleum sector, electricity, industry...etc. The center will provide its services not only in Egypt but also for the African countries.
- Several capacity building programs were conducted, in 2021 the first EE training within the sector middle management program was launched. More than 220 engineers attended a comprehensive capacity building program tackling the major prospective of EE activities and techniques applied in the oil and gas industry.
- The MoPMR is implementing the first digital energy management system in Suez Oil Processing Company (SOPC). The system is linked directly to the measurement devices on-site and provide real-time performance of the equipment, systems and process. The system will benchmark the EE performance and define the gaps. The system also will link the gap to the work procedures for the relevant departments in the company and identify the responsibilities to gap closure. Implementing such system in all the sector companies will enhance the EE performance and provide realistic and validated Energy data. The system can be linked to EGPC, holding companies and MoPMR.

| Company | Projects |
|---|---|
| The petroleum sector | Measurement and reduction of the Methane Fugitive Emissions and VOCs in cooperation with EBRD. |
| The petroleum sector | Develop Low carbon strategy pathway in cooperation with EBRD. |
| Suez Oil Processing Company (SOPC), Alexandria Petroleum Company (APC), Nasr Petroleum Company (NPC) | Oil Refinery Efficiency and Upgrade Programme |
| Egyptian Natural Gas Company (GASCO) | Waste-Heat Recovery System in Dahshour Compression Station |
| Cairo Oil Refining Company (CORC) | Upgrade of Air Preheater for Distillation Units (UNIDO- Motor System Optimizations) |

**Table 4: Current activities in EE**

## 4.3. Legal, regulatory, and Institutional framework

### 4.3.1. General assessment

Egypt lacks strong EE policies and regulations at the national level. Currently, the only law that stipulates EE of the electrical energy is the electricity law No. 87 of 2015, which was passed to enhance energy efficiency and to regulate a number of energy efficiency measures such as cogeneration, energy recovery, load management, and assignment of an energy manager for large electricity consumers (more than 0.5 MW). The same law promotes EE of electricity in industries and commercial facilities, energy labeling for equipment, energy efficiency codes and standards. It is to be noted that the electricity law focused only on electrical energy efficiency. The Egypt's National Determined Contribution (NDC), submitted in the process of Paris climate change Agreement, has identified EE as a major GHGs emissions mitigation option in all economic sectors including the petroleum sector[14].

The MoPMR is the highest governmental institution in Egypt responsible for setting out and overseeing the general policies and regulations governing oil and gas activities in Egypt. The authorities of the MoPMR were established by the decree No. 1451 of 1973. Among others, the MoPMR is responsible, through its affiliated entities, to regulate the production, distribution, and supply of petroleum products. It is further entitled to propose legal reforms for overseeing any impediments or challenges encountered within the sector. Several entities, EGPC, and three holding companies EGAS, Ganope, and ECHEM, have been established and affiliated to the MoPMR to implement the different petroleum policies. Thus, the MOPMR and its affiliates have the legal authority to develop and enforce any needed regulatory measures to improve energy efficiency across the sector more than 100 affiliated companies.

In 2015, a Petroleum Sector High Committee for energy efficiency was established and supported by a technical secretariat. The Committee is reformed by a Ministerial Decree number (414) in Jan 2020. The mandate of this committee is:

- Approval of energy efficiency strategy, as well as setting policies, programs and projects necessary for the implementation in the petroleum sector.
- Approval of energy efficiency agreements and projects of technical support with the international development organizations and approve the final studies and results of these projects.
- Approval of Energy Efficiency Action Plan (EEAP) for the petroleum sector (oil & gas).
- Issue the needed recommendations to apply energy efficiency improvement measures across sector companies.
- Facilitate the needed resources to implement energy efficiency projects in the sector's companies (financial, technical, and administrative).
- Review and approve training and capacity building plans in the sector's companies.
- Review and approve the energy efficiency annual energy efficiency reports across the sector's companies.
- Supervise the Petroleum Sector Energy Efficiency Conference and Exhibition (EPEEC).

[14] Arab Republic of Egypt, INDC

It is worth mentioning that the mandate of this Committee is only limited to oversee EE activities within the oil and gas sector, and it is not extended to do the same in the other oil and gas consuming sectors such as the industrial sector and the transport sector. Further, the quantitative objective of the Integrated Sustainable Energy Strategy (ISES 2035) aims at achieving 20 million ton-oil-equivalent saving in the year 2035. This will represent 18% of the energy consumption in the year 2035 through focusing on three main energy consuming sectors: building, industry and transportation. Oil and gas represent 94% of Egypt' primary energy consumption. Industry and transport consume 58 % of Egypt's final energy consumption. In addition, transport consumes two thirds of Egypt's total oil consumption. Thus, policies to improve EE in the industry and transport sector are crucial to realize the ISES 2035 target. Institutional arrangements and cooperation are highly recommended between the MoERE and MoPMR to address this issue.

Thus, the current institutional setup to govern EE in the sector consists of a High Energy Committee, EECD at the MoPMR, and EE departments at EGPC & the Holding Companies. The MoPMR issued a Decree to establish a dedicated EE Department (including structure of the department with the job description and the needed qualifications of the staff) in all affiliated companies directly reporting to the CEO of those companies. In 2022, the MoPMR issued a mandatory annual Energy saving targets for the affiliated companies aiming at achieving the national commitment of the sector to reduce the energy consumption of 18% reduction by 2035.

A new Gas law issued in Aug. 2017[15], with Executive Regulations issued in Feb 2018, and a new independent gas regulator was created. The gas law (Article 22.6) commits gas market players to enhance environmental protection and optimum utilization of national gas grid. However, the executive regulation of the same law[16] does not have any provisions on how to achieve or monitor this commitment.

### 4.3.2. Codes, Standards, and Labeling

At the national level, Electrical EE standards for four domestic appliances (refrigerators, washing machines, air conditioners, and electric water heaters) have been implemented. Compliance with these standards has not been evaluated regularly and there has not been any systematic procedure to ensure compliance with labels and to detect fraud. Only testing laboratories for the targeted appliances as well as for Compact Fluorescent Lights (CFLs) and ballasts have been established at the New and Renewable Energy Authority (NREA). There are no similar labeling schemes or Minimum Energy Performance Standards (MEPS) for industrial equipment such as motors, pumps, compressors, furnaces, and the like. In addition, no performance indicators are available for the different industrial processes and products to evaluate and benchmark their energy consumption with their local and international competitors. The same situation of codes, labels and standards does prevail in the oil and gas sector. Though the transport sector consumes 46% of the petroleum products, little has been done to improve energy efficiency in that sector. In the road transport mode, there are no minimum fuel efficiency standards nor energy labelling scheme for vehicles. Data such as fleet fuel economy, distant travelled per car per annum, and car stocks are rare. Only vehicle emission standards are mandatory for old vehicles according to the environmental law 4/1994 and its amendments. A 20-year retirement period for vehicles is recently enforced by the traffic law No. 66/1973 and its amendment.

[15] Law 196 for 2017, https://www.gasreg.org.eg/wp-content/uploads/gasreg_law.pdf

[16] Prime Minister Decree No. 239 of 2018

## 4.4. Licensing and contractual framework

Concession agreements used by EGPC and other Holding Companies does not address the issue of energy efficiency, hydrocarbon losses (flaring & venting) nor provide any incentives to upstream investors to encourage use of efficient technologies and practices. Only the environmental Law 94/1994 and amendments, required the new projects to carry out an environmental impact assessment (EIA) before embarking on the construction or the implementation of a project or relevant expansions. This regulatory requirement had been elaborated in the Executive Regulations of that Law in 1995 and its amendments and several EIA guidelines issued by EEAA[17]. In addition, a set of sector-specific guidelines were issued to help preparation of EIA reports[18]. These include a guide for undertaking EIA in the oil and gas sector. According to severity of environmental impacts, EEAA uses the following projects' classification:

- Category A: Projects which meet all criteria of lowest impacts.
- Category B project: Project which meet at least one criterion of the medium impacts and the rest is of the lowest impacts.
- Category C: Projects which have highly adverse impacts. These are required to prepare a full EIA study.

In addition, the category "B-scoped class" is introduced for projects, where the anticipated impacts are higher than "B-Class" and less than "C-Class". Based on EEAA guidelines, except for the fueling gas stations in non-sensitive areas (agriculture land, residential areas, protected areas, …etc), oil and gas projects are mostly categorized as B or C lists. EIA is not explicitly required any EE measures. However, mitigation of air pollutants such as combustions flue gases, gas venting and flaring require an EIA. Thus, using EE equipment and processes would reduce air emissions and help new projects and expansions of the existing ones meet the EIA regulatory obligations. In addition, and within the Egypt's vision 2030 and the transition to green economy, the Ministry of Planning and Economic Development in collaboration with the Ministry of Environment have issued in 2020, a "Sustainability Guidelines for the National Development Plan"[19]. The guidelines promote EE and wide use of RE in publicly funded projects in different economic sectors including the oil and gas sector. It calls for efficient use of energy resources, reduction of flared associated petroleum gases, and expanded use of RE whenever feasible. Based on this guide, the Ministry of Petroleum and Mineral resources, and its affiliated companies are required to adhere to those guidelines during the early stages of projects' planning and before application for public funding. Some of the indicators that will be used to measure sustainability of new state-funded projects are energy intensity (TOE/value added) and carbon footprint ($CO_2$/value added).

## 4.5. Existing Energy Pricing regime

It is well established that energy demand is price sensitive, and a rational pricing policy is the key to reducing energy waste and encouraging energy efficiency investment. Investments in EE in Egypt are hindered by low energy prices for decades, which historically were heavily subsidized. Energy subsidies have been a major culprit for the relatively high level of energy intensity. As a result of energy subsidies, the economics of EE projects was characterized by an artificially extended payback period. That, with other factors, led to the stock of inefficient technologies and equipment. Thus, the artificially low energy price is the single most important factor preventing the use of market forces to stimulate energy efficiency investment and behavioral changes in Egypt.

[17] EEAA, EIA guidelines (2009)

[18] EEAA, http://eeaa.gov.eg/ar-eg/الخدمات/تقييمالأثرالبيئي.aspx

[19] Ministry of Planning and Economic Development (MOPED) and Ministry of Economy (MOE), sustainability guidelines for the national development plan, 2020

Fortunately, the Government of Egypt has initiated a bold energy subsidy reform program that aims at phasing out energy subsidy in five years. The first phase of the program was implemented in 2014, followed by a second phase in 2017 and a third one in 2018. As a result, the percentage of fuel subsidies has fallen from 70% of total government expenses of the state budget in 2012/2013 to an estimated 50% of total government expenses in 2017/2018 (nearly 2.7% of GDP), amounting to approximately EGP 9.8 billion. Similarly, the Government of Egypt plans to phase out subsidies on electricity over three years, starting from the 2018/2019 fiscal year[20].

In the oil and gas sector, the situation is no different. The same energy pricing regimes are being used in different activities across the value chain. However, an automatic pricing mechanism for petroleum products is applied since 2018, when those products are priced based on a formula that reflects variations in international oil prices, currency exchanges, and other factors.

Thus, using market prices of energy products would improve the economic viability of EE projects and thus overcome one of the major market barriers to energy efficiency.

Furthermore, Associated Petroleum Gas (APG) flared, vented or used in the upstream operations and off-gas flared in downstream processes have no shadow prices. In the absence of any regulatory measures, the zero pricing APG is a major factor leading to increased gas flaring. A key component to successfully achieving gas flaring reductions is the use of incentives for APG utilization. The most obvious incentives are related to gas markets and the ability of upstream producers to sell recovered gas & products at a competitive gas price and to several different off- takers.

## 4.6. Financing of EE activities

Generally, the promotion of energy efficiency is inhibited financially by several factors including the high initial cost, the financial, technological and performance risks, and the scarcity of investment capital. Investors and funding Institutions find it difficult to reimburse their investments due to the specific characters of these projects and their associated risks. The high initial cost of EE technologies combined with the risks that the user should undertake create the need of promoting and applying innovative financial schemes. Thus, the most widely used financial mechanisms for such projects are Third Party Financing (TPF), and more recently, the Global Climate Fund (GCF).

## 4.7. Current Situation of EE investment in Egypt

There is a lack of availability of financing for EE projects. Multilateral development banks, financing institutions recently have restricted financing the fossil fuel projects including the EE projects in the petroleum sector.

Commercial Banks in Egypt, lacking the technical resources or the experience to recognize the cost and benefits of EE projects, perceive these as high-risk projects. Financing options are typically confined to traditional loans with unfavorable lending terms, which limit the size and the number of EE projects to be conducted.

A small partial guarantee fund (USD 280k) was developed in 2005 under the UNDP/GEF Energy Efficiency Improvement and Greenhouse Gas Reduction project (EEIGGR) project[21] and was quite successful in addressing the different barriers to EE financing, but had a very limited impact due to its limited size. The Credit Guarantee Company (CGC)[22] has added non-EEIGGR money in addition to projects (with a total value of EGP 68.85 million). This successful pilot experience has never been expanded or replicated.

[20] Ministry of Planning, Monitoring and Administrative Reform. (2018)., Egypt Voluntary National Review

[21] UNDP/GEF, FINAL EVALUATION Report, Energy Efficiency Improvement and Greenhouse Gas Reduction project, 2010

[22] Credit Guarantee Company (CGC), https://cgcegypt.com

Almost all activities related to EE have been supported by concessional funding from bilateral and multilateral agencies. On the government side, there are no dedicated and stable funding sources to promote and support EE activities and programs. The modalities of the EE fund created by electricity Law 15 / 2020 is not clear yet, and the fund is not operational. The Environmental Protection Fund (EPF) created by the environmental Law 4/1994 and its amendments is mandated, among others, to provide funding for investments in sustainable environmental projects such as pollution abatement, as well as cleaner technologies including EE projects. However, its focus has been on environmental protection rather than EE improvement. Some major fundings for EE initiatives in Egypt has come from two programs.

The first stage of funding came from Egypt Sustainable Energy Financing Facility (EgyptSEFF)[23]. EgyptSEFF had a $30 million US$ loan from the European Bank for Reconstruction and Development (EBRD) that was managed by the National Bank of Egypt. The second phase of the program saw the founding of Green Environment Financing Facility (GEFF), with an increase in investment to 140 million Euros. In this second phase, GEFF Egypt is a product of the European Bank for Reconstruction and Development (EBRD), working in cooperation with the Agence Française de Développement (AFD) and the European Investment Bank (EIB)[24]. The facility supports Egypt's green economy transition with €140 million of financing for energy efficiency and small-scale renewable energy investments to help reduce the impact of growing energy prices through investments.

Another source of funding was the Industrial Energy Efficiency (IEE) Project started in 2013, with a US$ 3,950,000 fund from the Global Environmental Facility (GEF) and input of the Egyptian counterparts that is equivalent to US$ 24,121,000 in cash and in-kind. Implemented by the United Nations Industrial Development organization (UNIDO), with the Egyptian Environmental Affairs Agency (EEAA) as the lead executing partner and in full cooperation with the Industrial Development Authority (IDA), the Egyptian Organization for Standardization, the Industrial Modernization Centre and the Federation of Egyptian Industries. It is designed to provide support to all stakeholders that are involved in the energy supply chain for the industrial sector (excluding national power plants and the electric national grid). Few companies from the oil and gas sector had access to grant technical support through the UNIDO/GEF project. These are ANRPC, ASORC, GPC, MOPCO, SIDPEC, and SOPC.

Additionally, the US Trade and Development Agency (USTDA) offered a grant of USD1.4 million to APRC and SOPC to fund studies to upgrade the two refineries including EE improvements[25].

The Commercial International Bank Egypt (CIB) has developed green finance products that promote energy efficiency and renewable energy technologies by offering clients financing packages supplemented by technical support, energy audits and a list of trusted suppliers[26]. EBRD started the implementation of medium/high-cost energy efficiency projects in two companies of the oil and gas sector. The first project is providing a 140 million USD soft loan to EGAS for the benefits of GASCO. The project consists of energy efficiency investments along the gas pipeline and transmission network system. The energy efficiency investments will aim to deploy technical and feasible projects in the following areas a) waste heat recovery technologies at Dahshour; b) gas metering data systems infrastructure[27]. The second project is another 250 million US$ loan for SOPC Energy Efficiency and Upgrade Program. This is to finance a package of energy efficiency investments and other refurbishments at the Suez refinery. In particular, the Project will focus on the installation of a New Vapour Recovery Unit (VRU), the refurbishment of the old coker units and a number of energy efficiency investments identified to improve operational performance, environmental footprint and utilization rate of the refinery[28].

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[23] EBRD, https://ebrdgeff.com/egypt_facilities/

[24] https://www.rcreee.org/project/egypt-geff/4426

[25] https://www.ogj.com/refining-processing/refining/optimization/article/14189442/us-grants-to-support-major-upgrades-at-egyptian-refineries

[26] UNEP, promoting sustainable finance and climate finance in the Arab region, 2021

[27] MoPMR

[28] MoPMR

EBRD has also supported the implementation of a technical study for methane emission recovery in the petroleum sector. The study including measurement of methane emissions in the gas supply chain and VOCs emissions from oil tank farm. The measurement campaign was conducted in June 2022.

Further, EGPC is financing a project in Alexandria Petroleum Company (APC) to modernize and upgrade the refinery with processes capable of producing higher value-added products, improving the energy efficiency and the overall performance, as well as reducing the environmental impacts[29].

Another option for supporting the APG recovery is the Carbon Credit for emission reduction. A pilot project is implemented in one of the affiliated companies in the petroleum sector (ZEITCO) during 2021. The project requires automatic measurements of the recovered gas quantities, validation process and auditing the operation to qualify for the carbon credit scheme.

## 4.8. Third party Finance: ESCOs

Third Party financing was developed and widely used worldwide to help companies finance investments without affecting their balance sheets. The user of efficient energy technologies does not have to finance the initial outlay that is required for the realization of the energy efficiency improvement. In contrast, ESCO is a one-stop shop that undertakes fully the financing, design, development, and operation of the project. The investment is reimbursed by payments related to the performance of the technology installed for a specific period, specified in the contract. Third Party financing always entails a series of services, including technological assistance and in-house energy audits. The ESCO provides a combination of engineering, financial and marketing skills, carrying out detailed energy audits, identifying EE opportunities, and choosing appropriate reliable technologies for making the planned energy savings, since the reimbursement of its investment is directly related to the performance of the project.

Some donor funded projects supported the development of the ESCOs market in Egypt where ESCOs helped clients secure financing from commercial banks and eventually to create a self-sustaining market for ESCO activity. Despite of this support, the results were a little disappointing. Some ESCOs were established and a national association for ESCOs was formed. However, most of the ESCOs were small, under-resourced, and focused on lighting efficiency improvements in Buildings. This is because energy end-users are hesitant to undertake Energy Performance Contract and local banks are reluctant to accept energy efficiency measures or products as collateral. In addition, highly subsidized energy prices in the past and lack of experience in measurement and verification have also limited the development of the ESCOs market.

## 4.9. Center of Excellence for Energy Efficiency

There is a continuous need for capacity building programmes focusing on each segment (upstream, refineries, gas processing and petrochemicals) giving technical and managerial training. The capacity building should also bridge the gap between theoretical and practical training through hands-on training on mini-plants and prototypes, simulation and virtual realities. Therefore, MoPMR is working on establishing the “Center of Excellence for Energy Efficiency” (COE). The COE could be responsible for the capacity development in the field of the energy efficiency in all energy sectors.

The CoE will provide various services to all energy sectors in Egypt and Africa including.

- Hands-on training in mini-plant: The trainees will perform Practical training on a mini-plant and exposed to the optimization practices as applied in the industry.
- Simulation Modules: this feature will be used for the training of engineers. They can practically train on altering the operational conditions to enhance the efficiencies and conserve the energy without affecting the running plant.
- Virtual Reality Simulator: this feature will be used for the Training of technicians and field operators. Virtual Reality capabilities will simulate field walkthrough to identify energy efficiency improving opportunities by field activities.

[29] MoPMR

- Theoretical Technical training sessions to enable the trainees to learn the scientific basis of the operation of each equipment and better understanding of the opportunities to save energy.
- energy efficiency Consultancy services to all energy sectors including energy audit, ISO 50001 certification and feasibility studies of the energy conservation projects and support the research, postgraduates, and proposals of the national policies in the field of the Energy Efficiency.
- Perform measurement campaigns to monitor energy parameters and emissions.
- Energy Knowledge Management; including best practices, energy efficiency monitoring and KPIs.

# 5. Barriers of EE in the petroleum sector

The EE in the petroleum sector of Egypt is a relatively new concept. The market for EE services and EE projects in the petroleum sector is at its infancy although significant efforts have and are being made by EECD and partners to implement energy audits, EE projects and training and awareness programmes in EE. However, barriers to EE still exist. The EE Strategy's goal is to stipulate measures to remove these barriers. An analysis of the main barriers is presented in the following.

## 5.1. Institutional and governance barriers

**Need for integration of EE in the development plans of EGPC, Holding companies and affiliated companies to include EE targets/measures/investments**

In 2022, MoPMR mandated all companies to achieve annual Energy saving targets. However, there is clearly a barrier in the fact that EE in not systematically included in the development plans of EGPC, holding companies and affiliated companies. Consequently, these organizations do not include energy saving commitments for EE measures and investments with budgets and timelines in their development plans. Furthermore, there is a need for technical support to the companies to implement these EE plans and a monitoring mechanism for EGPC and Holding Companies to assess progress and evaluate the results.

Moreover, no energy efficiency measures are included in the design and implementation of new projects, rehabilitation, or revamps of exiting projects, losing large energy saving potential. There is no regulation or commitment to enforce such provisions for new or revamp projects.

**Need to provide adequate resources and staff to the EE Departments at all levels (EECD, EGPC, Holding Cos, and affiliated Cos.)**

The EE Departments need to be adequately staffed to be fully functional. They need to be equipped with more human resources (technical, managerial, administrative) as well as financial recourses. This is critically important since the EE Departments are the spearheads of the organizations in terms of actually implementing EE projects and they need to have power to persuade the top management and the organization in general for the necessity and profitability of them.

**Need to improve, harmonize and standardize the scope of the Energy Efficiency Departments of EGPC, the Holding companies, and affiliated companies (standardization means standardized, manuals, KPIs, operational procedures etc)**

Besides the need to complete the creation of EE Departments in all or almost all organizations, there is a need to improve, harmonise and standardize the scope of them. This means that standardization of procedures, KPIs, monitoring systems, operation of ISO 50001, etc. is needed. This standardization could be carried out according to the different needs in operational conditions and procedures, tools and structures of the subsectors (refineries, upstream, gas processing, and petrochemicals). Progress is observed since MoPMR issued a unified job description and organization structure for EE departments in 2022 but the barrier still exists.

**A need for improve the legal mandate of MoPMR/EECD, EGPC and the Holding Companies' to include enforcement of implementing of EE policies**

MoPMR/EECD should issue and enforce the EE policies while EGPC and the Holding Companies should monitor the implementation of EE policies of the affiliated companies in the upstream, refineries, gas processing and petrochemicals. Such power should be clear and strong giving them the gravitas to set the rules for EE in strategic and operational policies of the companies and take measures for non-compliance.

**Lack of measurement and verification tools to demonstrate the energy savings of EE investments**

Measurement and verification tools are essential to a) introduce a systematic and scientifically accepted methodology to assess energy savings, b) to have acceptable estimates of energy savings and convince about the profitability and feasibility of EE investments and c) to finance EE investments. Such tools should be introduced in the operational procedures of the companies and the assessment of individual EE investments.

**Lack for digital energy efficiency reporting and monitoring system (e.g. energy benchmarks or energy intensity indexes, KPIs, etc.)**

The EECD, EGPC and the Holding companies should establish a standardized and computerized energy efficiency data reporting and monitoring system. This system may be the receiver of data regarding the energy performance of the affiliated companies. Data may also be originated from other courses like EGPC or the Holding Companies depending on the nature of the respective data. The purpose of such a system would be the provision of data for policy making and planning and the evaluation of policies and investments as well as the access of the public to specific data sets. In addition, the governance of such a system should be created and institutionalized. The governance includes a) roles and responsibilities of data providers and data receivers, b) guidelines for reporting, c) data collection forms and formats, d) clear mandates of managing and updating the data reporting system, e) a data validation mechanism to check and verify the completeness and correctness of the data, f) human capital for data collection and management of the system validation and management, g) the frequency of data reporting and h) data analysis subsystem. Such a system could be adaptable to the different operational conditions of the subsectors (upstream, refineries, gas processing, and petrochemicals). Furthermore, the energy statistics, for example KPIs, EE indicators, 'primary or final energy intensity', etc. need to be clearly defined. Pilot Digital Energy Management system is being implemented in SOPC. The system is linked directly to the measurement devices, systems and process and provide real-time performance monitoring, gap analysis and responsible departments to gap closure. Systems like that are crucial for all affiliated companies.

## 5.2. Legal and regulatory barriers

**Absence of regulation to make EE mandatory when new facilities are being designed or when rehabilitating or revamping existing facilities**

This regulation will impose EE measures to all new facilities being constructed and also to the facilities that are revamped or rehabilitated in a major scale from the early design phase. This would integrate EE technologies from the beginning of the design achieving higher energy savings and assure full integration with nearby facilities.

This barrier is very important to be considered. One of the main factors for the absence of regulation is the high associated cost required for acquainting EE equipment, technologies, process in designing the plants and facilities. The cost of performing the engineering, the calculations and analysis of the total cost over the whole plant life cycle in both cases (considering and not considering EE in the design stage of the plant) can play an important role in considering EE measures.

**Lack of an institutionalized and standardized governance mechanism for data collection and reporting system (with specific data providers, users, mechanisms for data collection and validation, standard data collection templates, specific roles, etc.) in EGPC, Holding Companies and Affiliated Companies**

The energy efficiency data reporting and monitoring system (which includes the data collection procedures) and its governance mechanism need to be institutionalized by regulation. This regulation should define, at least, the scope of the system, the roles and responsibilities of the parties, the data collection and data reporting procedures (including the data flow from various departments to the EE department at the affiliated companies), procedures for data validation, the human and technical resources needed and the data analysis framework. Furthermore, there is a need to define the structure and design of any data collection forms already being used by MoPMR, EGPC, the Holding Companies and the affiliated companies, mandatory. Currently, there is electronic data collection system with a fixed report template and defined responsibilities for data collection from the affiliated companies to EGPC, Holding companies and MoPMR. However, this system and its governance need to be re-assessed and improved considering the issues mentioned above.

**Absence of regulation to set Minimum Energy Efficiency Performance Standards (MEPS) for certain type of equipment (e.g. motors, pumps, boilers, etc.)**

MEPS for certain types of equipment could drive the market towards more efficient equipment, thus, higher energy savings. High efficiency equipment could be used in new designs or revamps. MEPS could also force the companies to replace old and inefficient equipment with new and more efficient one whenever technical and economic feasible.

**Absence of regulation to make ISO 50001 or other digital or non-digital energy management system in the process units mandatory to the companies of the sector**

ISO 50001 and other energy management system can drive energy efficiency and produce long-term energy savings in the process units and operation by integrating energy efficient methods into the management, operational and administrative procedures of the companies. EnMS will enforce the implementation of energy efficiency audits on regular basis. The absence of a regulation to impose the establishment and use of ISO 50001 or any other energy management system in the process units and operation is a barrier to EE in the oil and gas sector.

**Institutionalization of the EE organizational departments at all levels (EECD, Holding Companies, and affiliated Companies.)**

Regulation(s) that define the mandate, the scope and the organizational structure of the EE Departments of EECD, Holding Companies, affiliated companies and the significant energy consuming companies established under the investment law are needed These regulations will institutionalize the EE Departments in the most official manner. The key objective of the EE Departments is to define EE measures, manage their implementation and measure and validate energy savings to achieve the annual EE target as defined by the MoPMR. The EE Departments mandate and power will be strengthened if they are created by regulations(s).

**Lack of regulation for ESCOs and energy performance contracting (business models, financing instruments and insurance tools, standardized contracting vehicles, measurement and verification protocols, accreditation procedures, etc.) to create the market for ESCOs**

The establishment of energy performance contracting (EPC) and energy service companies (ESCOs) is a mechanism that can multiply energy savings and, in parallel, increase private business activity and growth in the EE sector. The establishment and operation of the EPC and ESCO should rely on rules to the mechanism that are agreed between the participating parties (the ESCOs, the banks, the energy users). These rules should be established by regulation in order to have more power. The primary reason of the existence of these rules is that the survival of an ESCO relies on the achieved energy savings which depend on many factors, other within and other out of the control of the ESCO, and are inherently uncertain.

**The concession agreements lack provisions that stipulate EE in the operation of the IOCs**

Currently, the concession agreements do not have any provisions for the IOCs to implement EE audits and measures. IOCs can achieve energy savings during the extraction and production of oil and natural gas. The concession agreements are instruments that can be used to incentivize or impose or encourage IOCs to engage in EE in their operation since they are mandatory for their licensing and operation.

**Enforcement of implementing the MRV methodology of APG in all upstream companies.**

In cooperation with EBRD, MoPMR prepared a standard Measurement, Reporting and Verification (MRV) methodology with the main guidelines to monitor the amount of gas flaring in the production facilities. The MoPMR established a dedicated committee for minimizing the gas flaring in the production facilities. In 2021, the committee issued a decree to start the implementation of the MRV methodology in three companies. Yet the methodology needs to be effectively implemented across the sector companies.

**Lack of regulation to monitor the consumption of the gas and petroleum products of the main consumers in downstream sectors**

Consumption of gas and oil products and the EE performance in the downstream sectors such as electricity, industry and transport should be monitored. The monitoring data will be used for policy making and planning and also for the evaluation of the effectiveness of policies and EE measures. In addition, monitored data will be used to evaluate the level of success of EE projects.

## 5.3. Financial and pricing barriers

**Lack of financial incentives such as tax breaks (reduced custom duties on energy efficiency equipment, offsets against company/corporate taxes, etc.), low interest loans for EE projects, free technical support costs, etc.**

Currently, there are no financial incentives for the companies to purchase and install energy efficient equipment. This is a barrier to EE in the oil and gas sector since the up-front cost of EE technologies can be higher than what the top management is used to approve. The absence of incentives makes the banks reluctant to fund EE investments. Furthermore, there seems to be only a limited number of low interest loans or other lending products that could facilitate the access to capital for EE projects. There is also a lack of funds (like a revolving fund) to finance EE investments in the petroleum sector.

The MoPMR does not have any penalty instrument like carbon taxes or carbon pricing to enforce the companies to implement GHG reduction projects in order not to pay taxes or to buy carbon credits.

**High upfront costs of EE equipment and technologies**

Generally, more energy efficiency equipment and technologies are costlier compared to the average in the market. This can be a barrier to the funding EE projects by the companies. The lack of financial incentives to bring the cost down aggravates the barrier. EE should be one of the main evaluation criteria for selecting and procuring all equipment, systems and design taking into account the Life Cycle Cost (LCC).

**High development cost of EE investments (audits, feasibility studies, engineering studies, installation, contract negotiation with vendors, etc.)**

The cost for the development of EE projects can be a barrier for the implementation of the investment. Currently, there are no programmes or incentives in place to cut down the development cost or provide technical assistance.

**The affiliated companies have difficulties in securing commercial financing for EE investments**

The EE investments are still perceived as riskier from the commercial banks due to uncertain financial viability. Therefore, EE is not among the favorite sectors of the commercial banks to lend and the later prefer conventional business lending. Even when the commercial banks are willing to lend for EE projects, their demands in collateral, balance sheets, interest rates can be prohibitive for the borrower. Furthermore, the low creditworthiness (lack of collateral or strong balance sheets) of some affiliated companies prevents commercial banks from lending for EE investments.

**The financial market for ESCOs and performance contracting is underdeveloped resulting in lack of commercial financing for companies that can operate as ESCOs**

The market is not mature enough for the Energy Service Companies (ESCOs) and Energy Performance Contracting due to absence of regulation, experience in the business models, financing instruments and/or insurance policies tailored to ESCO business models. Especially, the immaturity of the financial market in performance contracting has as a result ESCOs not being able to borrow from commercial banks and the market does not work.

**Off-gas has no cost in downstream “refineries and petrochemical plants”, giving no incentive for energy efficiency**

The off-gas and the flared & vented gases have no cost for the refineries and petrochemical plants. Thus, this creates no incentive for energy efficiency or the efficiency use of off-gases.

**Price of gas for own consumption and power generation in upstream companies is null to IOCs, giving no incentive for energy efficiency**

The gas self-produced and consumed on site and the flared & vented gases has no cost for the IOCs. This creates a disincentive for EE projects as the positive economic impact they would bring to companies is not clearly visualized, and the projects are difficult to be supported.

**Promotion of carbon credit for the EE projects and agreement with the Ministry of environment on the needed procedures**

A pilot project is being implemented in one of the affiliated companies in the petroleum sector (ZEITCO) during 2021. The project requires automatic measurement of the recovered gas quantities, validation process and auditing the operation to be qualified for the carbon credit. The Mom is currently arranging with the Ministry of Environment to define the procedures of implementing such type of projects. Carbon credit will enhance the EE projects economics and assist in spreading the EE projects across the sector by accelerating recovering of the CAPEX.

**Short pay-back and high IRR required from energy efficiency investments by affiliated companies**

To compete with other projects (production increases…etc.) and to be approved by their management, companies in the sector require the EE projects to have a short payback time and high Irate reason is not only the expectation of profitability but the fact that EE investments are perceived as riskier than the usual investments because of the inherent uncertainty of the energy savings. There should be a shift in this perception by continuous awareness and knowledge sharing on the potential of EE in the companies' policies. Top management is a key to move EE further within the company and make decisions of EE investments.

## 5.4. Market barriers

**Public companies do not have profit objectives; they only have production targets, so they do not have enough economic incentives to save energy**

This is a barrier to EE since the companies set their policies with the target to maximize the production but not the profit. Therefore, EE is not considered a main factor to be serious dealt with since it does not directly increase production.

**Low level of information dissemination on EE market players, investments opportunities, EE financing schemes, EE services providers, and EE technology suppliers**

Information about EE opportunities, technologies and investments as well as real success case studies is a key to adopt EE behavior and carry out EE investments by the companies in the sector. The low level of information to the key players in EE results in inaction due to limited knowledge. This barrier needs to be removed as priority.

**Absence of reward mechanisms for the affiliated companies which achieve or exceed energy savings targets**

The absence of a reward mechanism(s) is considered as an important barrier. Rewards to companies that achieve or even exceed their EE targets set the good example and motivate the sector to engage more in EE. The companies should also be able to present their achievements in public conferences and workshops so to have the opportunity to elevate their corporate profile. Recently there has been progress to alleviate this barrier, MoPMR had launched the "Energy Efficiency Excellence Award" to recognize the best EE projects and achievements implemented in the sector. The award will enhance the awareness and competition among all companies in EE. The first award was given in May 2022 and it is planned to be organized on annual basis and the winner was honored in the EE conference and Exhibition of the petroleum sector (EPEEC). However, more efforts still required and in a continuous manner.

**Absence of any mechanism to publicly report energy saving achievements by the affiliated companies for public recognition**

Public recognition of the companies which have managed to achieve or even surpass their EE targets is very motivating. The absence of a publicly reporting mechanism of the EE achievements creates no incentive to EE. Therefore, a publicly reporting mechanism should be created and linked with public recognition actions and the reward system.

## 5.5. Information and awareness barriers

**Need for establishment of industry networks for exchange of experience and best practices on EE and commitments on EE targets, audits and EE planning**

Networks can be invaluable communication channels to exchange information and knowledge on EE. They also tighten cooperation between their members. Networks can be the instruments for sharing best practices and experience, information and statistics as well as benchmarking. Therefore, they play a key role in elevating the dissemination of information and the awareness on EE.

**Top management of affiliated companies is towards the full potential benefits or profits from energy efficiency investments [thus, the EE investments not in a high priority list]**

Top management of the affiliated companies should fully have grasped the profit potential that EE can bring to the company. Moreover, the top management is insufficient aware of the full benefits of EE. In addition, there is little efforts to create and deliver specific awareness events to the top management of the companies. These events would increase the awareness and knowledge of the top managers on EE and explain how EE is a profitable business.

**Need for the establishment of an information and awareness center to disseminate information on EE in the sector**

Currently, information about EE is provided by MoPMR, EGPC and the Holding Companies. However, there is no dedicated entity that is mandated to provide and disseminate information about EE in the oil and gas sector or event to other sectors. An information and awareness center specialized in communicating the information properly at all levels of hierarchy would be an answer to the shortage of information. The center could systematically collect, organise, update, provide and disseminate information on EE to companies in the oil and gas industry.

**Lack of information, which limits affiliated companies' ability to gain adequate knowledge on EE technologies and equipment and to assess the risks of financing such projects**

There is a general lack of information and knowledge about EE despite the fact that MoPMR, EGPC and the Holding Companies are currently the hubs for information dissemination and the fact and events on energy and EE in the sector are organized frequently. Policies that increase and optimize the flow of information can be sought and/or continue: an energy efficiency center, networking, awareness campaign for top management, training, etc.

**No energy registry in the affiliated companies**

Energy registry (as part of the previously mentioned digital energy efficiency reporting and monitoring system) is crucial to monitor the performance of the EE in the affiliated companies and conducting EE audits. Hence the EE performance cannot be validated against historical performance. Thus, no information that can be used for awareness purposes exists. Furthermore, the availability of data is not sufficient for awareness and dissemination purposes.

## 5.6. Capacity barriers

**Need for training and certification programmes of energy auditors and energy managers**

The capacities of the energy auditors and the energy managers need to be strengthened in auditing the process plants and operation and their qualifications certified. The training and certification programmes existing today need to be extended and even more to be created to cover the full supply chain and activities in the sector. The market is in need for knowledgeable energy auditors who could conduct high quality energy audits in the process units and operation. It also needs good experts in energy management to follow the most effective methods for managing energy in the core businesses.

**Need for large-scale energy/energy efficiency capacity building programmes focusing on each segment (upstream, refineries, gas processing and petrochemicals) giving technical and managerial training**

Although energy and EE capacity building programmes have and are currently running, there is always room for improving the capacities. The capacities in the sector should always be updated and upgraded to keep up with the technological and policy trends. Further, building continuously the capacities and enhancing knowledge is the best investment in human capital. Therefore, such a need for large-scale capacity building programmes has emerged.

Moreover, there is a need to cover the gap between theoretical and practical activities through hands-on training on mini-plants and prototypes, simulation and virtual realities. The MoPMR is working on establishing the “Center of Excellence for Energy Efficiency” (COE). The COE could be responsible for such activity in addition to the capacity development in the field of the energy efficiency in all energy sectors.

**The affiliated companies need to strengthen their capacities on technical, business, project management and risk management which prevents them from developing bankable EE projects**

Building the capability to understand, develop and implement energy efficiency opportunities and their value to the companies is a critical way of overcoming the relevant barrier to EE. Training to be given to the companies is vital to this. In addition, there is a need to train companies on how to develop bankable EE projects to have high chances to get financial from banks or other financing institutions.

# 6. SWOT analysis

| Strengths | Weaknesses |
|---|---|
| **Strategy and policy level**<br>• There is a National Goal for reducing energy demand by 18% in all sectors up to 2035 introduced in the Integrated Sustainable Energy Strategy of Egypt to 2035.<br>• The EE is supported by HEC and MoPMR at the political level.<br>• MOP is already communicating with international parties and was able to secure technical support to perform Energy Efficiency studies and projects in the petroleum sector.<br>**Legal and regulatory level**<br>• In 2022, MoPMR mandated all companies to establish EE department in the affiliated companies directly reporting to the CEO.<br>• In 2022, MoPMR mandated all companies to achieve annual energy saving target.<br>• In 2022, MoPMR mandated all the affiliated companies to report the EE performance on quarter-annum basis according to specific KPIs.<br>**Institutional and staffing level**<br>• The HEC and its Technical Secretariat have been established.<br>• MoPMR, established energy efficiency and climate department. EGPC, EGAS, GANOPE and ECHEM have already established EE Departments.<br>• The process of establishing Energy Department, Energy Committees or assigning Energy Officers in the companies continues and a significant number of companies have established such structures.<br>• The communication channels between the MoPMR, EGPC, EGAS, GANOPE and ECHEM and the affiliated companies are open.<br>• In 2022, MoPMR issued a unified job description and organization structure for EE departments in the Affiliated Companies.<br>• MoPMR is working with the Ministry of Environment to define the procedures for implementing projects that generate carbon credits. | **Strategy and policy level**<br>• Absence of EE strategy for the petroleum sector which aims at creating the EE market and engage the public and private companies in EE investments.<br>**Legal and regulatory level**<br>• There is no legal or regulatory instrument(s) that could provide incentives, implement audits and EE investments or impose penalties of non-action.<br>• There is no regulatory obligation of the affiliated companies to engage in mandatory development and monitoring of energy management and EE investment plans regularly. The companies are not regularly submitting to EECD the EE plans.<br>• No incentives for the companies to implement EE projects.<br>• There are no voluntary EE agreements between the companies and the MoPMR or EGPC or the Holding Companies.<br>• EE is not incorporated in the operational procedures of the companies: there is no national procurement framework that supports EE, no guidelines for EE procurement.<br>• EE is not integrated in the design of new facilities or major rehabilitations or revamping of existing ones; no such regulatory instrument exists.<br>• The ESCO market is primitive because of the lack of regulatory instruments.<br>• Lack of regulation to monitor the consumption of the gas and petroleum products of the main consumers in downstream sectors.<br>• There are no labeling schemes or Minimum Energy Performance Standards (MEPS) for industrial equipment<br>• Absence of Environmental and Social safeguard policy. |
| **Capacity level**<br>• A training plan under the framework of the 4B component of the Modernisation Programme is implemented successfully.<br>• Availability of EE capabilities inside the petroleum sector (training companies, EPC companies, energy service providers, construction, operation services, certified personnel) with adequate experience in engineering EE projects.<br>• MoPMR is experienced in managing and supervising EE training programmes.<br>• MoPMR, EGPC, EGAS, GANOPE and ECHEM have experience in organising and carrying out awareness and communication actions (workshops, meetings, events, etc.).<br>• In general, in the companies, engineers that operate the equipment or the processes are knowledgeable of how can improve EE.<br>• MoPMR had launched the “Energy Efficiency Excellence Award” to recognize the best EE projects and achievements implemented in the sector.<br>• MoPMR is establishing the “Center of Excellence for EE” to bridge the gap between the theoretical and practical knowledge. | **Institutional and staffing level**<br>• The production is the top priority of the top management of the companies,<br>• The EGPC, Holding companies and affiliated companies do not regularly or systematically integrate EE in their development plans therefore there are no specific objectives or budget for EE.<br>• in-sufficient energy consumption and energy efficiency data The concession agreements lack provisions that stipulate EE in the operation of the IOCs.<br>• The EECD, EGPC, EGAS, GANOPE, ECHEM need improvements in their mandates and strengthening of authority enforce the implementation of EE policies.<br>• The EE organisational structures of the companies are fairly new and lack the authority to pass their policies into the operation of the companies.<br>• The EECD, EE Departments of EGPC, EGAS, GANOPE, ECHEM and the EE Departments of the companies are understaffed.<br>• A number of companies have not established EE Departments or have dedicated staff mandated and delegated to energy conservation duties. |

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| **Technical level**<br>• The progress of the Modernisation Programme is a success and it has achieved its targets.<br>• A number of EE investments have and are being implemented mainly with funding from international financing institutions and donors.<br>• No and low-cost measures have been implemented in some companies and energy savings achieved.<br>• The EECD, EGPC and the Holding Companies have developed an electronic data collection and reporting system. This electronic system has a fixed report template. The responsibilities collecting the data from the affiliated companies to EGPC, Holding companies and MoPMR have been defined.<br>• Significant number of companies (all intensive energy consuming companies) respond to the call of EECD, EGPC and the Holding Companies for data reporting and preliminary databases have been set up.<br>• Energy Management Systems such as ISO 50001 or other non-certified systems are operated by a number of companies in the sector (i.e. Enppi, SIDPEC, ETHDCO, MOPCO, EPROM).<br>• EE is often 'impeded' in other more extensive investments in terms of technical scope (i.e. in a refinery upgrade or revamping or process optimisation).<br>• MoPMR prepared a standard Measurement, Reporting and Verification (MRV) methodology with the main guidelines to monitor the amount of gas flaring in production facilities. In 2021, the committee issued a decree to start the implementation of the MRV methodology in three companies.<br>**Financial level**<br>• The companies do not face insurmountable challenges to get loans from banks. In some cases, large projects can get debt financing from international parties and mega technical assistance programs. | • Top management of the companies in the sector doesn't fully grasp the importance and benefits of EE.<br>• The operation of the Energy Efficiency Departments of EGPC, the Holding companies, and affiliated companies has not been harmonised and standardised (with standardised framework for manuals, KPIs, operational procedures etc).<br>**Market level**<br>• Public companies of the sector only have production targets but not profitability targets, so they do not have enough economic incentives to save energy.<br>• The information (EE opportunities, successful case studies, technologies, etc.) about EE is not disseminated efficiently between the various players in the sector.<br>• There is insufficient reward mechanism or incentives for the companies to encourage them to save energy.<br><br>**Capacity level**<br><br>• Insufficient capacities in EECD, EGPC and Holding companies to monitor and verify EE performance of the petroleum companies.<br>• The capacities in EE policies, planning, energy reporting, technical engineering, investment appraisal and project financing need to be further increased in EECD, EGPC, Holding Companies and the companies in the sector.<br>• Training and certification programmes for energy auditors and energy managers need to become more.<br>• Although a standard Measurement, Reporting and Verification (MRV) methodology for flared gases in the production facilities has been developed, it has not been applied to wide cases yet. |
| **Awareness level**<br>• Awareness in EE of the operating and production engineers in the companies is high.<br>• The energy service companies have high awareness on EE technical and technological solutions.<br>• EE Conference and Exhibition | **Technical level**<br>• Harmonised monitoring mechanisms (such as KPIs or benchmarks for each subsector-refineries, petrochemicals, upstream and gas processing) are absent or not used regularly.<br>• Although EECD, EGPC and the Holding companies have developed an electronic data reporting system, there is a need for a single, integrated digitalised EIMS across the sector to increase integrity, consistency and accuracy.<br>• The governance regime for the data collection and reporting in EGPC, Holding Companies and Affiliated Companies has to be re-assessed, improved, institutionalised and standardised.<br>• ISO 50001 or other digital or non-digital energy management system and energy audits are not mandatory for the companies of the sector.<br>• There is no study on the EE potential of the petroleum sector on wide scale.<br>• Lack of Minimum Energy Performance Standards (MEPS) for equipment used in the petroleum sector (i.e. gas turbines). |
| | **Financial level**<br>• The international oil companies (Joint-Ventures) in the upstream are not promoting EE in their operation mainly because the gas produced and consumed on-site, flared and vented gases come with no cost.<br>• Off-gases, flared & vented gases have no cost for the companies creating a disincentive for EE. |

| | |
|---|---|
| | • The EE equipment and technologies usually have higher up-front cost than the ones with average energy performance.<br>• High development cost of EE investments (audits, feasibility studies, engineering studies, installation, contract negotiation with vendors, etc.).<br>• The affiliated companies have difficulties in securing commercial financing for EE investments mainly due to the fact that commercial banks perceive EE investments as highly risky.<br>**Awareness level**<br>• Insufficient awareness because of the top management to realize the business opportunity and profitability of EE investments.<br>• There is no hub or centre to collect and disseminate information on EE in the sector in a centralised manner.<br>• The mechanisms for knowledge sharing and networking (like the industry networks) on how to save energy are underdeveloped.<br>• General lack of information on EE (technologies, access, financing, development of bankable projects, etc.). |
| **Opportunities** | **Threats** |
| • EE is fully supported by the energy strategy of Egypt.<br>• EE is an opportunity to increase the volumes of gas and oil for exports.<br>• EECD can be a role model for improving EE performance for all other ministries and the sectors that supervise.<br>• Availability of technical support and funding (mainly from international sources) for large EE projects.<br>• Availability of EE technology at reasonable cost.<br>• EE can open new profitable markets for energy service companies.<br>• EE can provide profitable investments for the petroleum companies.<br>• The EE potential, although not assessed, may be significant.<br>• EE provides an opportunity for modernization of the petroleum facilities' technology.<br>• EE increases the valued added of the petroleum and petrochemical products by decreasing the production cost.<br>• Global attention to climate change and Egypt's organization of the Conference of the Parties COP 27<br>• green finance products that promote energy efficiency and renewable energy technologies are available | • Subsidies in fuel prices delay EE projects.<br>• Fluctuating oil and gas prices.<br>• The price of gas for own consumption and power generation, flared and vented in upstream companies is null to IOCs, giving no incentive for energy conservation.<br>• Insufficient funds for medium/large projects.<br>• Insufficient awareness of the top management of the companies in EE may undermine the EE activities and business evolution of the companies, if not raised in the short-term.<br>• Still higher cost of energy efficiency equipment compared to 'conventional' equipment. |

# 7. Strategic Vision

The Strategic Vision of the EE Strategy 2022-2035 can be summarized in the following:

> ***"Support the economic improvement of energy efficiency in the petroleum sector while meeting the sustainability objectives of Egypt's vision 2030 and contributing to energy security and de-carbonization."***

# 8. Energy Efficiency Policy Statement

The energy policy is top management's statement of its intentions with respect to petroleum sector energy performance. The policy set the direction for energy management activities and provide the framework for using energy objectives and targets to achieve energy performance improvements. It is documented and communicated to personnel across all levels of the organization, including on-site contractors. The EE policy for the petroleum sector was developed under the JICA funded project (Annex I).

# 9. A two-staged EE Strategy

The EE Strategy is divided into two stages.

***Stage I 2022-2027***

During Stage I, spanning from 2022-2027, the goal is to overcome the barriers to EE in the petroleum sector. Overcoming the barriers, the market for EE will become more mature and the capacities will be reinforced. The target for Stage I is to achieve 10 % energy saving by 2027 from 2021 level.

***Stage II 2025-2035***

As the market for EE will become more mature, the institutional framework will be built and the capacities strengthened, larger energy savings can be achieved. This will be done if more complicated measures which can generate deeper energy savings are adopted. Thus, the target for this Stage is to achieve energy savings of 18% from 2035 energy forecasted consumption level.

Schematically, the two Stages can be depicted below.

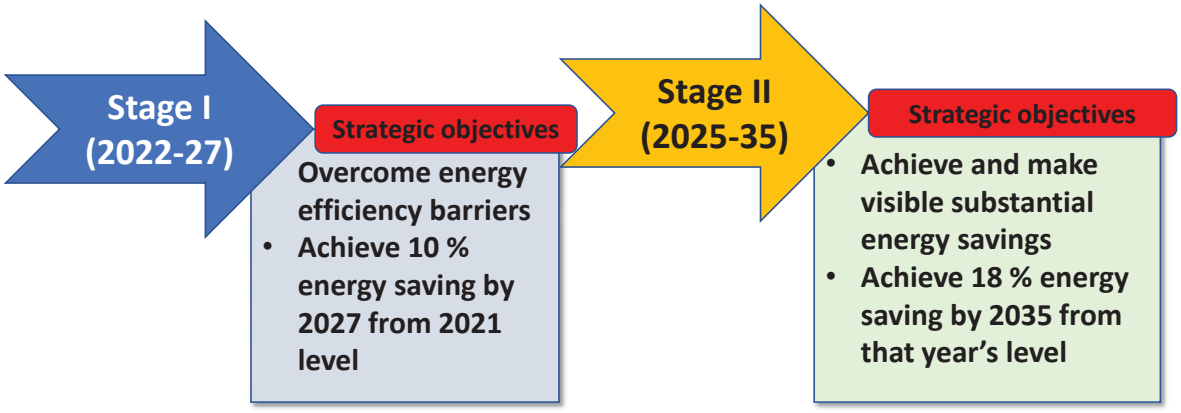



**Figure 10: The two Stages of the EE Strategy 2022-2035**

# 10. Energy Efficiency Measures

The two-stage strategic approach aims to achieve the two strategic objectives progressively as the existing barriers are being removed and the institutional capacity is being gradually built.

## 10.1. Stage I 2022-2027

### Goals of Stage I

The Goals of Stage I are as follows:

- Goal I-1: Develop the legal/regulatory and institutional framework
- Goal I-2: Building the Capacity of EECD, Holding Companies, and affiliated companies
- Goal I-3: Raise Energy Efficiency awareness
- Goal I-4: Develop EE financing schemes
- Goal I-5: Identify Energy saving potential
- Goal I-6: Implement low-cost EE projects across the sector.

The Goals are going to be achieved by EE measures. Therefore, for each Goal, the related measures will be analyzed below.

### Measures of Stage I

**Goal I-1: Develop the legal/regulatory and institutional framework**

The following measures would be implemented under Goal I-1:

1. Design a mandatory energy audit programme for heavy consumers

A mandatory energy audit programme will be designed and implemented in the significant energy consuming companies. The audit will be conducted within maximum 3 years from then start of the programme by a certified energy auditors' team. The energy saving opportunities identified by the auditors will be implemented within the period of 3 years.

2. Design of a mandatory harmonized energy reporting system

A harmonized energy reporting system will be designed, developed and used by all entities in the petroleum sector. The system will be designed and managed by EECD to support energy monitoring, benchmarking, and energy policy planning and analysis. The system will be digitized. In addition, the governance of such a system should be created and institutionalized. The governance includes a) roles and responsibilities of data providers and data receivers, b) guidelines for reporting, c) data collection forms and formats, d) clear mandates of managing and updating the data reporting system, e) a data validation mechanism to check and verify the completeness and correctness of the data, f) human capital for data collection and management of the system validation and management, g) the frequency of data reporting and h) data analysis subsystem. The use and governance of such a system will be institutionalized by regulation.

3. Update of procurement regulations to foster EE

The existing procurement regulations used across the sector will be revised to foster EE. Procurement preferences or criteria of selecting any equipment or utilities system (steam, fuel…etc.) and assure overall integration and optimization of the energy during the design of in new projects or existing facilities that are being rehabilitated or revamped will be given to energy efficient technologies, equipment, and services as energy efficiency will be main criteria of the evaluation.

4. Implement a mandatory Energy Management System for heavy consuming companies

Significant Energy consuming companies will be required to implement an Energy Management System such as ISO 50001 or similar in the process units and operation. The respective regulatory instrument(s) will be drafted to enforce this measure.

5. EE indicators such as energy intensity (e.g. TOE consumed /ton of output) become one of the Key Performance Indicators (KPI) for all entities.

Developing and using a set of EE indicators as one of the performance indicators used to appraise the significant energy consuming companies. Issue a mandate for all companies to report to EGPC and Holding companies their energy intensity, carbon intensity indicators, at least. EGPC and Holding Companies shall report to EECD the achieved EE target per activity (production, refineries, gas processing…etc.), the barriers to achieve the annual Energy saving target and the following year plan.

Indicators would also help in benchmarking. Benchmarking is an approach used by a number of industries to evaluate the energy performance of their processes in relation to best practice, usually within their own industry.

6. Update concession agreements to foster EE

Upstream operations consume around fifty percent of the sector's total energy consumption. The current concession agreements don't include any clauses that encourage energy efficiency and renewable energy and % hydrocarbon losses (flared, vented, liquid drains...etc.). agreements would be revised to mainstream EE/RE and a certain percentage of hydrocarbon losses into upstream operations.

7. Undertake a study on the options for reductions of Associated Petroleum Gas (APG) and off-gases flare

Associated gas used in the upstream operations and off-gas used in downstream processes are a major sources of hydrocarbon losses and they have no shadow prices. In the absence of any regulatory measures, the zero pricing of APG and off-gases is a major factor leading to increased gas flaring and a disincentive for EE. Conduct a study to identify the potential for financially viable flare reduction investments. The respective regulation and incentives to use the APG and off-gases instead of flaring them (e.g. for upstream companies for energy production) will also be developed. Target to minimize the % of hydrocarbon losses will be defined and included in the regulation.

8. Set Minimum Energy Performance Standards (MEPS)

The existing MEPS is limited to few home appliances. It is recommended that EECD/MoPMR cooperates with Ministry of Industry and Trade and Ministry of Electricity and Renewable Energy to develop MEPS for a series of equipment widely used in the petroleum sector such as motors, pumps, compressors, boilers, chillers, heaters turbines, etc.

**Goal I-2: Building the Capacity of EECD, Holding Companies, and affiliated companies**

The following measures would be implemented:

9. Establish EE Departments at affiliated companies

Complete the staffing plans of EE Departments in the affiliated companies to ensure sufficient staff qualified calibers exists, their operations manuals, annual training plan and provide the needed specific capacity building programmes. Regulation(s) that define the mandate, the scope and the organizational structure of these EE Departments will be developed. In addition, complete the staffing of the EE Departments at EECD, EGPC and Holding Companies and develop their capacity building plans.

10. Develop business plans for EECD/MOPMR, Holding Companies, and affiliated Companies with focus on their EE Departments

The business plans will include, for example, a vision, mission, and objectives. They will also include a business model for each, a mandate to design, implement, monitor, and enforce EE policies, and a potential funding source, a staffing plan, operational procedures, and capacity required. The business plans will also include policies to improve, harmonize and standardize the scope and communication of the EE Departments. This means that standardization of procedures, KPIs, monitoring systems, operation of ISO 50001, etc. will be suggested by the business plans.

11. Design EE harmonized information system for policy and planning

The design of EE information system will include architecture, governance, role of the admins, data to be collected, data validation mechanisms, reporting requirements, access policies for different stakeholders, etc.

The harmonized energy reporting system (measure #2) would be part of this system.

12. Develop system of EE indicators at all levels (sector, sub-sector, company)

As part of the harmonized information system (measure #9), a system of EE performance indicators will be developed. These indicators will form an integral part of the Monitoring, Verification, and Reporting (MVR) mechanism of this Strategy.

13. Implement sector-wide EE training programmes

Design and deliver a training plan for the EE departments at affiliated companies, training plan for EE department at EGPC & Holding Companies and training plan for EECD at MoPMR. The training plan shall be linked to the job descriptions and roles in the EE departments.

Coordinate with developing agencies and partners to continue and expand training programme (similar to the current EU-funded one) to build the needed EE technical, economic, and managerial capacity at all levels. The training programme will build upon the existing experience in capacity building programmes. The training programme would increase the capacities of the affiliated companies on technical, business, project management and risk management and development of bankable EE projects. The Center of Excellence for Energy Efficiency (COE) will be utilized for implementing this measure and provide hands-on training in mini-plant and exposure to the optimization practices as applied in the industry.

14. Develop EECD website

An EE page was developed as part of the website of the MOPMR. This page will be upgraded to an entire section for EECD and serve as the hub for EE information exchanges and flow for the petroleum sector.

15. Develop a harmonized EE MRV protocol and provide training on this

MRV protocol of EE actions includes estimating, reporting, and verifying their EE effects, as well as monitoring their implementation. The aim is to assess whether EE targets have been achieved and thus, enhance transparency and accountability. An MRV protocol will be proposed for this strategy below (section 11).

16. Strengthen the training and certification programmes for energy auditors and energy managers

In order to build the needed capacity for conducting energy audits and energy management activities across the sector, certification training programs need to be identified and widely used.

**Goal I-3: Raise Energy Efficiency Awareness**

The following measures would be implemented:

17. Develop an EE knowledge management system

As part of the harmonized information system (measure #9), an EE knowledge management system will be developed to serve as a one-stop shop for knowledge dissemination including success stories, case studies, BAT, EE market data, EE service providers, EE equipment suppliers, etc. This system will be accessible to all stakeholders.

18. Encourage the establishment of industry networks/associations

Industry networks and associations play a crucial role in information dissemination and sharing of experiences. The aim is to encourage affiliated companies to join already existing professional associations such as e.g. “Association of Energy Engineers”, or form a national or sectoral network for EE.

19. Design and implement an awareness campaign across the sector

Awareness on the multiple benefits of EE should be raised at all levels. An awareness campaign should be designed and implemented to send targeted messages to different stakeholders in the sector in order to ensure successful implementation of this strategy and realize its targets. The awareness campaign can be implemented regularly, and the next campaign build upon the results of the previous campaigns. The campaign should include specialized approach and messages for the top management of the affiliated companies. The reason is that top management is pivotal in decision making and should be fully aware of the benefits of EE in their enterprises.

The Egyptian Petroleum Sector Energy Efficiency Conference and Exhibition (EPEEC) is a key element to spread the EE knowledge and awareness. The EPEEC should be organized annually.

20. Design and announce EE prizes for best Company, best EE project, best employee, etc.

To encourage responsible and energy awareness behaviors, recognition of achievers and pioneers would encourage others to follow suit. Widely publicized prizes at the sector level will be announced. In this way, mechanisms for the public recognition of excellent EE achievements will also be created and the achievements will be widely known thus, increasing awareness. Recently, MoPMR had launched the “Energy Efficiency Excellence Award” to recognize the best EE projects and achievements implemented in the sector. More EE prizes and competitions shall be organized with different criteria for success depending on their goals (e.g. best CO2 reductions, best cost/benefit ratio, best EE project, etc.). The future prizes and competitions will build upon the experience of the “Energy Efficiency Excellence Award”.

21. EE to be part of the Annual Reports of EGPC, Holding Companies and affiliated companies

In 2022, MoPMR mandated all companies to achieve annual energy saving targets. Taking this opportunity, annual reports of EGPC, Holding Companies and affiliated companies will include EE action plans, EE targets and level of achievements, EE investments, energy savings and associated GHGs emissions reductions, and successful case studies. Annual reports should be approved and signed by the CEO of the companies. Further, any EE investment plan should also be approved and signed by the CEO. Technical assistance to the companies to develop EE action plans and implement the respective EE investments will be provided.

**Goal I-4: Develop EE financing schemes**

The following measures would be implemented:

22. Develop a harmonized methodology for economic and financial evaluation of EE investments

To facilitate economic and financial evaluations and screening of different EE opportunities, and to attract third party finance, a harmonized methodology for financial and economic evaluation of EE projects will be developed and used by all entities.

23. Assess the feasibility of creating super ESCO

Super ESCO would facilitate investments in EE opportunities. A study would assess the feasibility of creating a super ESCO or ESCO under the current circumstances of the petroleum sector using the available capacity of the affiliated companies.

24. Develop a harmonized Performance Contracting Scheme

One of the main barriers of developing the ESCO market is the lack of a harmonized performance contract. If a super ESCO proves to be feasible (measure #23), a harmonized model for a performance contract would be developed, tested, and validated. Under this Scheme, insurance policies for the EE projects under performance contracting and financing tools would also be developed, tested, and validated.

25. Implement a pilot project to validate the ESCO business model under local circumstances

This measure would depend on the completion of measure #23, and measure #24, If the ESCO model proves to be feasible, and when the model performance contract would be developed, a pilot case for implementation would be selected and completed. Results of the pilot case would be widely publicized among different stakeholders.

26. Assess the feasibility of establishing Sector's EE revolving fund

A financing mechanism is a central element of any EE strategy, given the current financing barriers. A revolving fund is a sustainable mechanism for facilitating investment in EE projects across the sector. The fund should include mechanisms to bring the up-front cost and the development cost of EE investments down and facilitate the access to capital with favorable terms for the affiliated companies in the sector and ESCOs.

The revolving fund will generate cost savings. These savings are tracked and used to replenish the fund for the next round of investments, thus establishing a sustainable funding cycle and realizing energy savings. Proposed funding of the revolving fund could come from:

- Concessional loans and/or grants from development assistance organizations
- Government budget allocations
- A one-time seed capital from the annual operating budgets of companies
- Contributions from Corporate Social Responsibility allocations
- A levy of X%/ price of liter of gasoline sold, Diesel sold, price of cu.m. of natural gas sold (to be included in the existing fuel pricing formula)
- A levy based on the carbon content of the fuel consumed by different end-users
- X % of royalty fees.

Technical assistance to apply for funding to the fund and develop bankable projects will be provided to the companies.

27. Assess the feasibility of using the existing credit guarantee scheme for EE projects

The Credit Guarantee Company (CGC)[30] had implemented a successful pilot experience in financing EE projects. A study to assess the feasibility of using the same mechanism to promote EE investment in the sector will be undertaken.

28. Develop an environment and social safeguard policy for the oil and gas sector

Mainstreaming environmental and social sustainability considerations into all projects will ensure effective and sustainable transition to greener economy in line with Egypt's vision 2030, and the priorities of the international community, such as meeting the obligations of the Multilateral Environmental Agreements (MEAs) such as the Paris agreement on climate change, and the UN Sustainable Development Goals (SDGs). This measure will develop a Mechanism for addressing environmental and social issues in projects design, implementation and operation. It ensures mainstreaming environmental and social sustainability considerations in project design in line with the current national legislative framework.

29. Assess the feasibility of designing and deploying a carbon credit for the EE and RE projects

Putting a price on carbon encourages efficient ways of reducing emissions and discourage high-carbon options. As per Article 6 of the Paris agreement, mitigation activities such as EE and RE projects can generate carbo credits that are tradable. Rules and procedures of the new mechanism was approved in the COP 26 in Glasgow[31]. As proceeds from carbon credits would enhance the economics of EE and RE projects, MoPMR would coordinate with the Ministry of Environment to make use of such new opportunity.

**Goal I-5: Identify Energy Saving Potential**

The following measures would be implemented:

30. Implement sector-wide energy audits for major consuming processes/technologies to identify potential for energy savings

To identify energy saving potential across the sector, an energy audit program will be conducted for the major energy consuming processes, technologies, and equipment. This will facilitate screening the energy efficiency opportunities and prioritize them for implementation based on the audit's outcomes. The MoPMR had developed a technical Energy Efficiency Audit Methodology (TEEAM) and was applied in the four audits conducted under the EU-funded project. The TEEAM should be the main reference for conducting the audit.

31. Develop EE voluntary agreement scheme for major consumers

In order to accelerate energy efficiency improvement, the sector needs to consider more innovative, market-oriented approaches together with the regulatory instruments. Well-designed voluntary agreements will play a critical role in raising the awareness of companies and engaging them with the materialization of multiple energy efficiency benefits. Under a voluntary agreement, the EECD/MoPMR and an affiliated company negotiate and agree on energy-saving and GHG emission reduction targets, time schedules, action plan to achieve the targets, supportive measures offered by EECD, and penalties in case of non-compliance. Technical assistance to participate in the voluntary agreement scheme and achieve the targeted energy savings will be provided.

32. Develop and assess the feasibility of EE targets per company

Energy targets are important drivers to implement EE measures. Mandatory targets can also stimulate the interest of the top management in investing in EE. The sector has already set an annual target to be achieved by every affiliated company. In 2022, MoPMR mandated all companies to achieve annual energy saving targets. An assessment of whether these targets are achievable, what are the barriers, what are the success factors, what needs to be done to make them happen will be conducted at the end of Stage I.

[30] Credit Guarantee Company (CGC), https://cgcegypt.com

[31] https://unfccc.int/sites/default/files/resource/cma2021_10_add1_adv.pdf#page=25

33. Shift to NGV or EV for sector's transport means

This is to continue the current program of using Compressed Natural Gas (CNG) as transport fuel within the current policy of switching from liquid fuels to natural gas in order to expand a new market for natural gas, make a significant contribution toward improving air quality and protecting public health. In addition, electric vehicles are likely to represent the future of the automotive industry. The sector should play an exemplary role to follow in promoting electric vehicles to help reduce the consumption of petroleum products, mitigate greenhouse gas emissions, and improve air quality.

**Goal I-6: Implement low-cost EE projects across the sector**

The following measures would be implemented:

34. Develop an energy audit programme and implement annual work plan for each company to implement low-cost measures

Eligible companies for energy audits are not only the significant energy consumers but also the non-energy intensive companies. No cost/low-cost energy efficiency opportunities are low-hanging fruits that can achieve quick and visible cost-effective energy savings in a very short period of time, thereby demonstrating the multiple benefits of energy efficiency to the company performance. The primary focus of this measure is to capture no/low-cost energy savings widely available throughout the sector. Therefore, an energy audit programme will be developed and implemented to identify the no cost/low cost opportunities in the affiliated companies and then annual work plans for the implementation of the EE opportunities will be elaborated by the companies and monitored by EGPC and Holding companies.

35. Phase out inefficient lighting systems

The focus of this measure is phasing out inefficient lighting products and systems, and phasing in efficient, mainly LED, ones by the end of Stage I. LEDs are becoming the dominant lighting technology worldwide. They have an extended working life, significantly reduce CO2 emissions, reduce power bills by 50 to 90% and minimise replacement (i.e. maintenance) costs. New procurement practices for lightning should focus on energy efficiency as selection criterion.

## 10.2. Stage II 2025-2035

**Goals of Stage II**

The Goals of Stage II are as follows:

- Goal II -1: Promote EE in processes and equipment
- Goal II -2: Benchmark major energy consumers against industry standards
- Goal II -3: Minimizing gas venting and routine flaring (starting from stage 1)
- Goal II -4: Improve EE in road transport & electricity generation (working with the MoERE and the MoT
- Goal II -5: Harness the potential of RE across the sector (starting from stage 1)

Summarizing the results of the measures in Stage I, it is emphasized that the legal and regulatory framework for EE investments and reporting was developed and applied to the companies of the sector. Further, the systems for statistical data collection and analysis will be developed and used for policy making and planning as well as for policy monitoring and evaluation. In addition, the financing instruments to increase the access to capital for implementers of EE projects have been developed, tested, validated and lunched in the market. Finally, during Stage I, awareness, knowledge and networking in EE has been enhanced. The capacity of top management of the companies is strengthened to understand the benefits of EE projects. Moreover, the potential for EE savings has been investigated and no-cost or low-cost measures are being carried out.

The rationale of the EE Strategy is that the effective and successful implementation of the proposed energy efficiency measures during Stage I of petroleum sector EE strategy will pave the road and lay down the necessary foundation for efficient execution of Stage II of the Strategy. In Stage II deeper energy savings and more long-term impacts will be targeted.

The following is a brief on the various recommended measures to be implemented in order to achieve the previously mentioned goals of Stage II.

## Measures of Stage II

**Goal II -1: Promote EE in processes and equipment**

36. Adopt Best Available Technologies (BAT) for new plants design and/or during rehabilitation, revamping and expansions of existing plants

Best Available Technologies (BAT) is generally defined as *"any form of technology that challenges existing conventional technology and is often being promoted as more in harmony with nature*". To achieve EE for a new plant or during revamping, rehabilitation or expansion of existing ones several considerations have to be taken into account for the optimization of three components within facility and process; these are feedstock, fuels, and heat & power:

1. For feedstock: Minimize any feedstock losses by making use of all feedstock components.
2. For fuels: Minimize the amount of fuels imported to the process through use of efficient combustion equipment and by using low-value products produced from the feedstock as energy sources. In addition, minimizing the losses from the utilities system (i.e leakage, vents and drain of steam system, water system…etc.)
3. For heat and power:
    - Minimize heat and power demand through process optimization
    - Minimize heat and power losses through design optimization and integration.
    - In most oil and gas processes there is extensive potential for heat losses from steam systems, fired-heaters (furnaces and other flue gas exhausts), flares, inadequate insulation, insufficient heat recovery, etc.

EE design can be applied across all oil and gas processes and facilities either if it is new or going through revamping, rehabilitation or expansion. The EE design will consider and apply BATs. BATs can be applied in a broad scope of areas:

- Design of a process with low power and heat demand
- Design and selection of efficient system components (e.g. boilers, heat exchangers, reactors, distillation columns, piping, fittings, control architecture, etc.). This involves consideration of new technologies and comparison of the life-time energy savings of different alternatives.
- Designing O&M procedures to maintain efficient performance.
- Overall integration of the utilities systems in the site(steam systems, fuel systems, water…etc) and potential integration between adjacent facilities.

The usage of BATs should be stipulated by regulation(s). Studies should be carried out to investigate potential economic or other incentives for adopting BATs.

37. Use of efficient motors, pumps, and compressors (using the BATs)

Motors, pumps and compressors, combustion turbines& engines and heaters are considered among the main energy consuming equipment in all petroleum segments. Therefore, adopting BATs for motors, pumps and compressors is considered among the most effective measures for saving utilized energy in various petroleum segments. The usage of BATs should be stipulated by regulation(s). Studies should be carried out to investigate potential economic or other incentives for adopting BATs.

38. Implement programmes for technology and process improvements (include audits, eligibility criteria, incentives, etc.)

Several EE technologies are being utilized in the petroleum sector segments in Egypt to perform different activities. The choice of the appropriate technology for each activity is a very important decision as it depends on several factors including the type of the activity or the processes in which the technology must be utilized, the various parameters controlling that activity or process, the type of inputs or raw materials utilized and outputs or products produced, the availability of the necessary financial, energy and qualified human resources, etc.

In addition, the choice of the technology also affects the level of inputs and raw materials utilized, the energy requirements, the products produced and their quality, the efficiency of energy utilization, the amount of pollutants and GHG emissions and more importantly the efficiency and competitiveness of the plant in which the technology is being utilized. The choice of the appropriate and more energy efficient technology is considered as an important decision or enabling factor for achieving the targets and objectives of energy efficiency strategy.

On the basis of the above, it is important that integrated programmes are developed to enable the eligible beneficiaries to use high energy efficiency technologies. The framework for EE technologies[32] programmes implementation is promoted:

- **P*erforming energy audits*** that will help in: (1) Collecting all the necessary data and information on various segments activities, processes and equipment of main energy consumers. (2) Identifying and assessing areas that need energy efficiency improvements, appropriate technology selection, expected energy and cost savings in addition to greenhouse gas GHGs reductions, associated costs and investments needed, etc., (3), selection criteria for technologies,
- ***Implement eligibility criteria*** to choose the most eligible segments, activities and processes, in which selected EE technologies have to be implemented,
- ***Providing incentives*** to encourage operating companies to utilize the most energy efficient technologies. Examples of incentives include: (1) tax and custom duties exception for purchased efficient technologies and equipment, (2) favorable cost for provided services, (3) favorable interest rates and repayments periods for necessary loans for the purchase and installation of efficient technologies and equipment from financial entities e.g. banks, etc. Studies should be performed to identify the suitable type and level of incentives.

**Goal II -2: Benchmark major energy consumers against industry standards**

The recommended measures to achieve that goal include the following:

39. Undertake benchmarking analysis by sub-sector (upstream, refineries, gas processing, petrochemicals)

The main concept of energy benchmarking is to assess a defined system's energy performance against a reference system. It is defined as the tool which enables entities (facilities, organizations, companies, etc.) to analyze their energy use and compare their energy use, greenhouse gas emissions and best practices with other similar entities[33]. It is recommended that the benchmarks are defined in the sub-sector level (as initial phase). The reason is the easiness of comparison between different entities in the same sub-sector. Further studies are required to investigate whether benchmarks could be defined at process or equipment or system level for each sub-sector.

Having defined the benchmarks, the companies of each sub-sector should be compared to the benchmarks. This should be imposed by regulation. The comparison would mean that the companies will be enabled to:

- Identify their current status of how energy is consumed by different activities, processes and major equipment basically in terms of types of energy consumed and level of consumption,
- Define areas within each facility of existing data gaps and the necessary efforts and actions needed to fill those gaps.
- Compare the benchmarks with the current performance of the same activities, processes, equipment, and processes within the facility,
- Identify potential for energy efficiency improvements and set future targets and measures.
- MEPS should be continuously updated based on the result of benchmark.

[32] The following are some examples of the most important recommended EE technologies to be utilized in the petroleum industry in Egypt: cogeneration, electricity generation from turbo-expanders, boilers' energy efficiency improvements, steam system efficiency, waste heat recovery, condensate recovery systems, efficient insulations to reduce thermal losses, minimize oil, oil products and natural gas transportation and distribution losses.

[33] Source: IEA, "Driving Energy Efficiency in Heavy Industries", 2021 https://www.iea.org/articles/driving-energy-efficiency-in-heavy-industries

40. Use the matured energy management data/information systems to benchmark heavy consumers

Energy intensive consumers should have already installed and operate energy management systems in Stage I. In addition, these companies should have been certified for operating the energy management system. Having experience from operating such systems, they will be used to benchmark the energy performance of the consumers.

**Goal II -3: Minimizing gas venting and routine flaring**

Egypt was among the first countries worldwide to implement the necessary measures for minimizing gas flaring at petroleum sites; mainly in the Gulf of Suez region in the early 1980s. In the year 2020, Egypt ranked number 13th of top countries of gas flaring worldwide. Total gas flared volumes estimated at about 2.36 Bcm in the year 2020 representing 1.7% of total world gas flared and 3.6% of total natural gas production in Egypt[34].

In 2017, The MoPMR had endorsed the initiative to achieve zero routine flaring by 2030. In 2022, Egypt had joined the Global Methane Pledge (GMP) to boost its efforts regarding reducing methane emissions from the petroleum and natural gas sectors.

The MoPMR issued the ministerial decree (no 1935- Year 2020) concerned with the activities and projects of recovering and utilizing the associated petroleum gases in the petroleum sector.

Successful implemented projects and initiatives for minimizing gas flaring and venting worldwide showed that the existence of an effective gas flaring and venting policy framework is a necessity to overcome and remove all existing barriers that hinder achieving that goal.

The lack of clear and inadequate policies and strategies for reducing gas flaring in Egypt is considered among the main causes for continuous gas flaring which also can be translated to the absence of effective frameworks to regulate gas flaring and venting.

Technically, the “natural gas” component of Associated Petroleum Gas (APG) flared can be utilized in a number of ways: gas reinjection and gas for oil lift, grid and off-grid power applications, Compressed Natural Gas (CNG), mini liquefied natural gas, mini gas-to-liquids (GTL), mini gas-to-liquids (GTL); mainly methane as feedstock to produce ammonia for fertilizer production and methanol, marketing of liquid petroleum gases (NGLs; mainly LPG), and injection into the gas transportation network[35]. Achieving the third goal of implementing Stage II of the petroleum sector EE strategy which is “Minimizing gas venting and flaring” and the reduction of methane emissions can be accomplished through the implementation of the following measures[36]:

41. Implement the Egypt-Flare Gases Monetization Program (E-FGMP)

The main objectives of flare gas monetization program include but not limited to the following: (1) eliminating economic waste, (2) improving environmental and public health, and (3) increasing energy access[37].

Achieving these objectives can be accomplished through the implementation of the following program main measures:

41.1. The development of gas routine flaring and venting policy framework

This proposed framework aims at providing guidance for regulators, policymakers, and industry leaders seeking to develop practical approaches to unlock the economic value of flared gases (APG)[38]. In setting and developing the proposed gas flaring, venting and methane emissions policy framework several important recommendations and issues should be considered[39]:

[34] WB, Global Gas Flaring Report GGFR, 2020

[35] S. Banerjee and P. Toledano, “A Policy Framework to Approach the Use of Associated Petroleum Gas, Columbia Center on Sustainable Investment, 2016.

[36] ESCWA, “Reducing Gas Flaring in Arab Countries a Sustainable Development Necessity”, 2019.

[37] S. Banerjee and P. Toledano, A Policy Framework to Approach the Use Of Associated Petroleum Gas, Columbia Center on Sustainable Investment, 2016

[38] https://ccsi.columbia.edu/content/policy-framework-approach-use-associated-petroleum-gas

[39] S. Banerjee and P. Toledano, A Policy Framework to Approach the Use of Associated Petroleum Gas, Columbia Center on Sustainable Investment, 2016.

1. Regulations to enforce accurate measurement and quantification of flaring venting and methane emissions in all activities in the sector. Define the responsibilities for data collection, monitoring and maintaining a data base for the flaring sites.
2. Effective enforcement of flaring, venting and methane emissions regulations requires the presence of a regulator whose interests are severed from the economic interests of the operator.
3. Regulatory oversight of routine flaring and methane emissions abatement measure has to be assigned or delegated to a single independent entity with credible powers to enforce said measure. Where use of an independent regulator is not possible, taking adequate steps to create a credible and transparent enabling environment for investors can be an alternative.
4. Prohibit and sanction all venting, routine flaring and methane emissions activities except in instances where the facility operator has successfully applied for a special permit or waiver and issue technical guidelines for reducing associated impacts.
5. Foster a regulatory environment that enables market-driven utilization strategies.
6. To ensure economically rational APG and methane utilization strategies, develop reliable technical and commercial understanding at each phase of the APG value chain to inform the requirements for APG use.

It worth to mention that the building blocks and reform areas for gas routine flaring and venting policy framework include: gas routine flaring and venting reduction targets, permits of gas flaring and venting, operator obligation, economic test, gas flaring approval procedures, and minimum technical standards.

41.2. Strengthen the legal mandate of MoPMR, EGPC and other Holding Companies on gas routine flaring

Egypt does not have a comprehensive and well-specified regulatory framework that focuses specifically on reduction of gas routine flaring and methane emissions. In addition, no technical norms, rules or standards exist that guide operators in gas flare and methane emissions reduction investment decisions. The MoPMR established a committee to work on developing plans to achieve the zero routine flaring target by 2030.

The mandates of EGPC and EGAS to achieve zero routine gas flaring, venting and methane emissions reduction should be clearly defined. The responsibility of monitoring and quantifying the amount of gas flared and methane emissions, and establish and maintain a database of the flaring, venting and methane emission sites should be defined. Furthermore, the regulatory powers of these institutions in terms of gas routine flaring and venting should also become clear. These elements should be institutionalized by regulation. Special attention should be paid to the dual role of EGPC as the regulatory agency to monitor gas flare levels and enforce flare limits and, simultaneously, as joint venture partner in upstream operations. This may create conflict of interest.

41.3. Strengthen EGPC and other Holding Companies capacity on Measurement, Reporting and Verification (MRV) of gas flaring and venting

During the early months of 2022, MoPMR, in cooperation with EBRD, developed a standardized MRV methodology for gas flaring. This methodology should be tested and applied in real cases. Upon successful implementation in the pilot cases, the methodology should be enforced across the sector. Similar methodology should be developed for the methane emissions.

In terms of measuring, the EGPC and other Holding Companies should strengthen their capacities in (1) precise methodology for estimating flares, and (2) technical standards and requirements for meters. In terms of reporting, they should receive capacity building on (1) existence of a harmonized reporting methodology and reporting & tabulation format, (2) training of concerned staff and employees on the proposed methodology and reporting format, (3) setting the regulatory necessary framework for gas flaring and venting reporting including making this process as one of the daily dominant activities of EGPC and other holding companies concerned staff and employees. In addition, capacities of these entities should be strengthened in developing and applying concrete procedure for verification of the APG amounts flared, vented and methane emissions.

42. Develop a permissible flaring limit or target

A maximum gas flaring level of 0.7 MMSCFD is specified in the MRV methodology. The flaring limit faces potentially competing and conflicting objectives of, on the one hand, gas flare reduction and on the other, crude oil output maximization. While some gas flare utilization options exist to combine these objectives (e.g. enhanced oil recovery), they are not necessarily always applicable and/or result in temporary oil production shut-ins.

Issuing flaring permits is a regulatory tool which gives operators of oil and gas producing companies the right to flare specific volumes or quantities of APG and is applied either for new or existing oil and gas facilities and installations. In all jurisdictions with successful gas flare reduction regulatory frameworks, a fundamental component is the permitting procedure and system. There are no formal permits for APG flaring in Egypt. Flaring permits specify the volume of allowed gas flaring levels and are allocated on the basis of the nature of flaring at the site, the volume of flaring and economic viability of gas flare reduction investments. They set the benchmark against which any operator is considered compliant with flaring regulations or not. Without permits, operators do not know what their allowed level of flaring is and consequently are not incentivized to invest in flaring reduction. The lack of gas flaring permits means that operators do not know in any year what level of flaring is acceptable or not. They will also have no information on the volumes and instances of flaring for safety or maintenance reasons. This can be specified in the flaring permits and can be used as a guide for upstream operators to regulate flaring and/or invest in the necessary infrastructure.

**Goal II -4 Improve EE in road transport**

The transport sector is considered as one of the major energy consumers and greenhouse gas emissions in Egypt and the main consumer of the petroleum products. Already implemented policy reforms and measures to promote energy efficiency and reduce greenhouse gas emissions in the sector included, and not limited to: the promotion and development of public transport, upgrade of vehicles fleet, the development of transport infrastructure, traffic management, enhancing engines tuning up, and fuel switching to cleaner and more efficient fuels such as natural gas, automatic pricing mechanism of the gas and petroleum products… etc.

This Strategy includes additional proposals or improvement of the existing measures to promote EE in road transport. It is anticipated that the proposed measures will be performed in close cooperation with the Ministry of Transport and its affiliated concerned entities. The following is a brief on each of these measures:

43. Introduce energy efficiency labels for passengers' cars

Energy efficiency passenger cars labels is a tool used to help passenger cars owners or drivers choose new cars with low fuel consumption, and $CO_2$ emissions. In addition, passenger car labels aim to encourage car manufacturers to reduce the fuel consumption of new cars. The Energy Label for passenger cars ranks passenger cars from energy efficiency categories A to G regarding their fuel consumption and weight. Public awareness campaign should be organized to demonstrate the benefits of energy efficient cars.

44. Develop fuel economy standards for passengers' cars

In general, Fuel economy can be defined as a measure or indicator of vehicle's efficiency which means "the distance traveled per unit of fuel consumed" represented in Kilometer per liter (KM/L) in metric system or miles per gallon (MPG) in empirical system. Sometimes fuel consumption or fuel intensity (expressed as liters of fuel consumed per distance travelled) rather than fuel economy is used to measure the fuel efficiency of a vehicle. As passenger cars represent almost the major segment of vehicles stock or inventory in most countries (represents about 48% of total registered vehicles in Egypt in 2020, of which about 44.6% as private cars and 3.4% as taxi), therefore, it is important to develop fuel economy standards for passenger vehicles or cars as an important vehicles' segment which affect vehicles overall average energy efficiency and consequently total fuel consumption in addition to pollutants and greenhouse gas emissions.

To achieve the ultimate target of implementing this measure till the year 2035, the following framework/or approach and steps can be followed for Light Duty Vehicles (private and taxi passenger's cars or vehicles) to start with:

1. Collect the necessary data for estimating passenger cars average fuel economy.

2. Recommend the necessary measures to achieve targets during each period, e.g.:

- Specifying specific fuel economy of imported or local manufactured passenger cars,
- Incentives for vehicles that achieve setting fuel economy targets (e.g. taxes, custom duties, vehicles license renewal, high-ways and parking fees exemptions, etc.).
- Old vehicles scrapping initiatives including the package of incentives provided by such initiatives,
- Incentives for efficient CNG and electric vehicles, etc.
- Establish the necessary supporting institutional, regulatory, financial, market, informational, and awareness arrangements and setup.

3. Continuous review of the framework to identify deficiencies and taking the necessary correction measures and actions.

45. Tax/customs/licensing fees incentives for electric mobility and CNG vehicles

Compressed Natural Gas (CNG) and electric vehicles represent one of the most available alternatives and cost-effective opportunities for achieving energy efficiency, pollutants and greenhouse gas emission reduction in transport sector in Egypt and most of countries on the globe. Despite the remarkable progress and development occurred in the CNG vehicles market in Egypt since the early 1990s till now that resulted in more than 335 thousand CNG vehicles fueled by 225 CNG fueling stations (as of the end of the year 2020), the development of electric vehicles is still at its early stages. The success of the CNG vehicles industry and market development in Egypt during the previous years since the early 1990 is attributed to the set of implemented policies among of which are: (1) the prevailed price differential between CNG and gasoline in favor of CNG vehicles operation. (2) The economic and financial incentives offered to overcome the barriers of higher up front cost of vehicles conversion to CNG and encourage cars owners to use CNG as a fuel for their vehicles, (3) The implementation of the smart card program that allowed vehicle's owners to get the necessary loans to convert their vehicles to CNG from some local commercial banks with simple and minimum collateral in addition to payment of the conversion cost in the form of monthly installments with favorable interest rate and payments periods. (4) The development of the necessary needed infrastructure (CNG vehicles conversion centers and fueling stations), etc. However, and despite of the previously mentioned given incentives other financial incentives remained to be provided for electric mobility and CNG vehicles.

The design features of institutional, regulatory and financial measures have to be investigated so that respective measures are designed and implemented. Tax/customs/licensing fees incentives for electric mobility and CNG vehicles should also be investigated and designed. Public Awareness campaigns is needed to demonstrate the benefits of converting to cleaner fuel.

46. Promote public transportation

Public transportation is considered as one of the most cost-effective polices to achieve energy efficiency improvements in the transport sector, pollutants and greenhouse gas emissions reduction, and sustainability. Examples of the remarkable and recognized achieved efforts and implemented projects in that regard include as examples:

- The occurred developments and expansion plans of Cairo metro,
- The recent implemented and planned projects which includes as examples:
    - The Light Rail Train LRT.
    - The development of Alexandria tram and Abu Kir rail line.
    - Cairo monorail.
    - Sokhnia – Alamin high-speed train.

Cairo metro is considered as a good example for the importance of public transport development and its multiple positive impacts. Estimates of expected fuel savings and greenhouse gas GHG emission reduction as a result of Cairo metro development indicated the following: total accumulated fuel saving during the period (1989-2021) estimated at more than 18-million-ton oil equivalent (Mtoe). Accordingly, total accumulated CO2 emissions reduction during the same period (1989-2021) estimated at more than 51 million tons. The MoPMR and MOT should coordinate and sponsor public awareness campaigns to promote the use of public transport.

**Goal II -5: Harness the potential of RE across the sector**

Several renewable energy technologies have been applied or have the potential for use in oil and gas fields. Each has advantages and limitations. Using renewables offers many advantages, including saving the hydrocarbon resources and consequently help increase its lifetime, minimizing GHG emissions, and enhancing the industry's public image. The industry continues to research and develop new technologies to use renewable energy in oil and gas fields. The continuous growth in the application of renewables in the industry will help move the world along a sustainable energy path[40].

The following is a brief description of these measures.

47. Survey the potential of using RE across the sector value chain

[40] https://jpt.spe.org/application-renewable-energy-oil-and-gas-industry

Implementing this measure is considered as the first and important step towards achieving an effective and efficient utilization of renewable energy in the petroleum sector in Egypt with ultimate goals to:

- Identify the most eligible and feasible segments, activities and processes for renewable energy technologies implementation and assess the associated existing potential.
- Identify existing barriers that could hinder the efficient deployment of renewable energy technologies and the necessary needed actions and measures to overcome those barriers.

48. Investigation of RE feasibility for electricity generation, process heat and boilers feed water heating

RE applications that cover the whole value chain of the petroleum sector extending from the production of oil and natural gas in the upstream segment to different processes and end-use activities and energy systems include the following:

1. Using photovoltaic (PV) panels for electricity generation,
2. Using Concentrated solar power (CSP) for the production of combined heat & power. While produced power (generated electricity) could be utilized for different applications such as driving of equipment (motor, pumps, compressors, blowers, fans, etc.), lighting, the operation of computers, electronic circuits and devices, etc.; produced heat could be utilize for process heating through generating steam, etc.,
3. Use of solar water heaters for heating different water and other fluids streams including boilers feed water.
4. Other RE technologies (Geothermal using depleted oil wells, biofuels, hybrid solar-diesel turbines…etc.)

The feasibility of RE technologies should be investigated on specific applications in the different sub-sectors of the petroleum sector. Guidelines per technology should be issues to facilitate the application of RE technologies.

# 11. Indicators and Monitoring Process

As you cannot manage what you cannot measure, the key to reducing energy use and sustaining decreases over time is providing top management and executives with the right information, to enable informed decisions that balance energy use and cost with other objectives such as productivity and profitability. The process of monitoring the progress of implementations of the Strategy will comprise the following:

1. A regulatory instrument (Ministerial Decree) will be issued to give power to EECD, EGPC, and the Holding Companies to monitor the progress of implementation of the measures identified in the Strategy and Master Plan and to mandate the affiliated entities to improve their EE and contribute to achieving the sector's EE targets.
2. The EECD will be the responsible institution for monitoring and evaluation of the progress of implementation of the Strategy and the Master Plan.
3. Activities for monitoring and evaluation will be reported annually to the High Energy Committee using the harmonized reporting system (Measure #2), potential deviations and corrective measures taken will be identified, if any.
4. The harmonized reporting system will identify the parameters to be monitored and their frequency of monitoring.
5. Annual Monitoring and evaluation reports will be uploaded in the information system (Measure #11)
6. The High Energy Committee will serve as one of the evaluation bodies (the other being EECD), make annual assessment of the level of implementations of different measures and make necessary corrections/amendments of the action plan as it deems necessary.
7. A summary of the progress report of the action plan will be uploaded to EECD website (Measure #14) and disclosed to all the stakeholder every year.

8. Indicator-based monitoring is one of the most effective forms of monitoring and evaluation. Indicators are valuable tools for tracking progress on measures implementation and achievement of targets. Outputs and performance indicators (Measure # 12) for all the measures will be identified in the action plan.

# 12. Annex I - EE policy for the petroleum sector developed under the JICA funded project

**Arab Republic of Egypt**
Ministry of Petroleum and Mineral Resources

**جمهورية مصر العربية**
وزارة البترول والثروة المعدنية

**Energy Efficiency Policy**
**of the Egyptian Petroleum Sector**

Within the framework of Ministry of Petroleum and Mineral Resources vision and strategic goals aligned with sustainable development goals, greenhouse gas mitigations, and Egypt Vision 2030, the Ministry is committed to improve the energy efficiency in all operations and activities within the Egyptian Petroleum Sector.

Egyptian Petroleum Sector will achieve its energy efficiency goals while sustaining the business activities by:

- Establishing Energy Management System (EnMS), integrated with other management systems applied in the petroleum sector and ensure continuous improvement of energy Efficiency.
- Developing Energy efficiency strategy, objectives and targets and continually monitoring, reporting and benchmarking its achievements by the adoption of necessary governance and regulations.
- Availing all necessary resources to achieve energy efficiency objectives and targets, and to embed energy efficiency in the daily operating practices as a part of the petroleum sector culture.
- Implementing the optimum energy efficiency performance in all new designs, rehabilitations, revamps and procurement processes as well as promoting the uses of cleaner sources of energy.
- Consistency with the relevant legal regulations, international commitments and other requirements regarding energy efficiency, energy consumption and associated emissions.

**سياسة كفاءة الطاقة**
**لقطاع البترول المصري**

في إطار رؤية وزارة البترول والثروة المعدنية وأهدافها الاستراتيجية نحو تعظيم القيمة المضافة للموارد الطبيعية، بما يتوافق مع أهداف التنمية المستدامة، وإجراءات تخفيف الانبعاثات البيئية في إطار تنفيذ رؤية مصر ٢٠٣٠، تلتزم وزارة البترول والثروة المعدنية بتحسين كفاءة الطاقة في جميع العمليات والأنشطة داخل قطاع البترول المصري.

سيحقق قطاع البترول المصري أهداف تحسين كفاءة استخدام الطاقة مع الحفاظ على إستدامة أنشطة القطاع من خلال:

- إنشاء نظام إدارة الطاقة، والتكامل مع كافة أنظمة الإدارة القائمة في قطاع البترول، وضمان التحسين المستمر للأداء في مجال كفاءة الطاقة.
- وضع استراتيجية لتحسين كفاءة الطاقة، وتحديد الأهداف والغايات ذات الصلة، والمتابعة المستمرة لتحقيقها بالرصد والقياس والمقارنات المعيارية بأفضل الممارسات من خلال تطبيق النظم واللوائح المطلوبة.
- توفير كافة الموارد اللازمة لتحقيق أهداف وغايات تحسين كفاءة الطاقة، وإدراجها في الممارسات اليومية لأنشطة القطاع لتصبح جزءً من ثقافة قطاع البترول.
- تطبيق المعايير المثلى لتحسين كفاءة استخدام الطاقة في تصميم كافة المشروعات الجديدة وعمليات إعادة التأهيل وتحديث مختلف معدات الوحدات الإنتاجية، مع تعظيم استخدام مصادر الطاقة الأنظف.
- التوافق مع التشريعات والقوانين المحلية والالتزامات الدولية والمتطلبات الأخرى ذات الصلة فيما يخص تحسين كفاءة استخدام الطاقة، استهلاكات الطاقة والانبعاثات المصاحبة.

**مهندس/ طارق الملا**
**وزير البترول والثروة المعدنية**



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| **Address:** | DAI Global Austria GmbH & Co KG<br>Lothringer Strasse 16<br>A-1030 Wien<br>Austria |
| **Contact person:** | Stephane Neyreneuf |
| **Signatures:** | |
| **Date of report:** | 23 September 2022, Final |
| **Authors of report:** | Ibrahim Abdel Gelil<br>Hamed Korkor<br>Kostas Anagnostopoulos<br>Amira El-Mazni |