THE WORLD BANK

GAS FLARING AND METHANE EMISSIONS REDUCTION IN EGYPT

PROJECT PRE-FEASIBILITY ASSESSMENT

TERMS OF REFERENCE

May 2025

1. BACKGROUND

The World Bank established the Global Flaring and Methane Reduction (GFMR) trust fund in 2023 at COP28. GFMR now serves as the primary World Bank vehicle for global efforts to reduce methane and carbon dioxide emissions from oil and gas sector operations. 140 billion cubic meters (bcm) of natural gas is still being flared annually during oil and gas production and processing worldwide, and an estimated 125 bcm are lost to venting and leakage.

GFMR grant funding is intended to support emissions abatement activities that would otherwise not be implemented due to national policy priorities, regulatory gaps, budgetary and financing constraints. The Bank will establish the extent to which grant funding support a selected project under consideration will enable its implementation. The underlying rationale is that some emissions abatement opportunities, e.g. methane leaks, can be cash-positive to address, and that a reasonable amount of supplementary own funding may in principle be mobilized by government entities and state-owned operators.

Oil and gas operations in Egypt have been estimated[1] to generate 41 million tons of CO2 equivalent (MMt CO2e) CO2 and methane (CH4) emissions, out of which roughly 48% stem from methane venting and leaks and an additional 14%, in the form of CO2, from gas flaring, with the balance being produced by operational combustion processes during production, processing, refining and other activities. It has also been estimated that up to 7 MMt of CO2e emissions could be effectively abated in the short to medium term at either zero or negative net cost, including flare gas utilization, recovery of methane through storage tank vapor recovery, and detection and repair of methane leaks along the oil and gas value chain.

One of the key objectives of the Ministry of Petroleum and Mineral Resources (MoPMR) is to create an attractive investment environment, while maintaining safety, energy efficiency and reducing emissions. Accordingly, methane abatement and flare gas recovery are within the main pillars of decarbonization to reduce the carbon intensity of the petroleum sector's hydrogen carbon resources. The Ministry is therefore collaborating with its key strategic partners to pursue reducing the carbon footprint of hydrocarbon resources, including reducing greenhouse gas emissions, while meeting the increased need to secure affordable and sustainable energy. Egypt joined the Global Methane Pledge in June 2022 and has since updated its nationally determined contributions to include a target to reduce greenhouse gas emissions from flaring of associated gases in the oil and gas sector by 65% by 2030 against business as usual (BAU) scenario in 2030, using a 2015 baseline. This goal is to be primarily achieved through the recovery of currently flared petroleum gas associated (APG) to the production of oil.

[1] Decarbonization of Oil and Gas Operations in Egypt, World Bank report, July 2023

In addition to flare gas recovery prospects, several high-impact opportunities for cost-effective reduction of methane emissions have been identified by the Ministry of Petroleum and Mineral Resources and its national oil companies (based primarily on outcomes of 2 methane measurement campaigns supported by EBRD). The dominant abatement opportunities are, in order of decreasing emission volumes, fugitive emissions from oil tanks, leakages from equipment, and venting from incomplete gas flaring. Financing these projects is a challenge for both the state-owned and private companies in the sector due to persistent budgetary and funding constraints and the resulting need for prioritization of essential operational investments during the capital allocation process.

The Ministry, on behalf of EGPC, EGAS and their affiliates, has submitted four prioritized Proposals for GFMR funding (please see Annexes 1-4 for more detailed Proposal concepts):

1. **Proposal: Oil Storage Tanks Upgrading and Installation of Vapor Recovery Systems**. The objective is to significantly reduce methane fugitive emissions from oil storage tanks by retrofitting and upgrading their existing single or double wiper seals to mechanical shoe seals and secondary wiper seals, and/or through the installation of vapor recovery systems. The following indicative tank station projects have been pre-selected:

    - Abu-Sanan Field, T-oil station operated by General Petroleum Company (GPC) – Western Desert - 10 tanks
    - Gharib Oil Treatment Station operated by General Petroleum Company (GPC) – Eastern Desert – 32 Tanks.
    - Gharib Offloading Terminal operated by General Petroleum Company (GPC) – Eastern Desert - 21 Tanks.
    - El Hamd Oil Treatment Station operated by General Petroleum Company (GPC) – Eastern Desert – 6 Tanks.
    - Um El Yusr Oil Treatment Station operated by General Petroleum Company (GPC) – Eastern Desert - 17 Tanks.
    - South Bakr Oil Collecting Station operated by General Petroleum Company (GPC) – Eastern Desert - 16 Tanks.

2. **Proposal: Flare Gas Recovery.** The objective is to achieve zero routine flaring and minimize methane slip from prioritized and selected gas flares (to less than 2% of flared gases as per best international practice) through gathering APG that is currently flared for power generation for on-site field requirements, the displacement of higher carbon fuels, and improvement of energy efficiency in operations, and/or through the optimization of gas flare stacks to limit atmospheric methane slip emissions. Indicative flare gas recovery projects to be considered, prioritized according to the estimated volume of flare gas, are the following:

- Kalabsha 2 site operated by KPC - 2.5 MMSCFD
- Petro Nefertiti site operated by Petro Nefertiti Company - 2.5 MMSCFD
- Shoab Ali site operated by Gulf of Suez Petroleum Company (GUPCO) at - 2 MMSCFD
- Low-pressure gases from GPY field operated by GPC in the Western Desert - 2 MMSCFD
- Western Desert Gas Complex at Egyptian Natural Gas Company (GASCO) - 1.7 MMSCFD
- T-Gas station operated by GPC in the Western Desert - 1.5 MMSCFD
- Razzak site operated by KPC - 1.5 MMSCFD
- Badr-1 site Western Desert Petroleum Company WEPCO, - 1.2 MMSCFD
- Saqqara site operated by Gulf of Suez Petroleum Company (GUPCO) - 1 MMSCFD
- Badr-3 site Badr El-Din Petroleum Company BAPETCO - 0.9 MMSCFD

3. **Proposal: Gas Flare Measurement (GFM) Program**: In the absence of accurate measurement of gas flare volumes and components, the objective is to accurately quantify and monitor the volumes of gas being flared at oil and gas facilities, thus informing the optimal technical and economic abatement solutions to address them and/or to optimize the flaring efficiency to reduce greenhouse gas emissions, improving operational energy efficiency, and enhancing environmental sustainability.

   The proposed Gas Flare Measurement Program (GFM) will be implemented as follows:

   - Installation of flow meter connections for 77 existing flares
   - Installation of permanent industrial thermal flow meters for flares exceeding 0.7 MMSCFD for 25 existing flares

   The flare measurement phase will be managed by Alexandria Petroleum Maintenance Company (Petromaint), an EGPC affiliate company that provides a large array of services and solutions to Oil & Gas Upstream and Downstream Facilities.

   This GFM program will inform the identification of opportunities and prospects for additional projects for implementation of flare gas recovery projects, based on actual measured flare gas volumes.

4. **Proposal: Methane Leak Detection and Repair (LDAR) Program.** The objective is to identify, quantify, and repair methane leaks in the oil and gas sector thus reducing greenhouse gas emissions, improving operational energy efficiency, and enhancing environmental sustainability. The project will focus on:

i) Setting up and staffing of a task force within the Ministry of Petroleum and Mineral Resources' Center of Excellence for Energy Transition (COEET) to identify, measure and prioritize methane emissions abatement opportunities as a service for the oil and gas sector in Egypt, purchasing high accuracy measuring equipment, and building capacity in the COEET.
ii) In consultation with MoPMR and its affiliates, support the identification and selection of 3-4 sites for the future implementation of pilot methane LDAR projects with GFMR grant support.

It is expected that COEET will provide services to EGPC, EGAS and GANOPE affiliates to measure baseline emissions, as well as post-abatement emissions verification. The respective affiliates will be responsible for repairs.

The following indicative sites have been selected for implementation of pilot LDAR projects:

- GASCO, Amerya LPG Recovery plant
- EGPC, Ras Shukheir Gas Plant Unit 104
- SUCO, Zeit Bay Gas Plant

2. OBJECTIVES

The World Bank intends to hire a consulting company to improve the conceptual definition, conduct the detailed assessment, and prepare a pre-feasibility study for each of the four project Proposals submitted by MoPMR that describes in detail its concept; scope; technical, financial, economic, and commercial feasibility; estimated emissions abatement volumes; risks; funding gaps and recommended financing package structure; organizational implementation readiness; project management provisions; procurement plan; implementation plan; and environmental and social impacts.

The objectives of the consulting assignment are (1) to support the MoPMR with the conceptual definition of the prioritized project Proposals that the MoPMR, on behalf of EGPC and its affiliates, has submitted for consideration, (2) to enhance the World Bank's/GFMR's understanding of the projects included in the Proposals, and, (3) to inform World Bank/GFMR post-assignment screening and selection of each Proposal and of the projects included and selected in each Proposal for consideration of a GFMR implementation-grant.

3. SCOPE

The assignment will be carried out in two phases:

Phase 1: During Phase 1 of the assignment, in close coordination and consultation with the Ministry and its affiliates, the project Proposals as submitted by MoPMR will be (a) preliminarily assessed to determine their technical, economic, financial and commercial viability and their expected emissions abatement impacts, and (b) defined and developed in detail in terms of their concept, components, cost and feasibility.

The tasks carried out during Phase 1 will inform the World Bank grant preparation process and will determine whether to proceed -or not to proceed- with the supplemental assessments described under Phase 2 below.

Phase 2: Contingent on the conclusions of Phase 1, concurrence by the MoPMR, and at the sole discretion of the World Bank, Phase 2 of the assignment will carry out the supplemental tasks normally required to inform the World Bank's pre-appraisal stage of an eventual recipient-executed (RE) grant preparation process for the selected projects. The second phase will be conducted in close coordination and consultation with World Bank-designated specialists in the required fields, namely, environmental and social, procurement, and financial management.

PHASE 1: PROJECT PRE-FEASIBILITY ASSESSMENT

For each project Proposal:

- Task 1.1 Project Concept review and definition:
  - Conduct a joint preliminary technical, commercial, and economic feasibility review and estimation of abatement volumes for the project Proposals described above with MoPMR-designated counterparts to assess their feasibility and identify any data and information gaps to be addressed in the course of the assignment to adequately inform the detailed assessments to be conducted under the Tasks described below.
  - In coordination and consultation with the Ministry and its affiliates, and on the basis of the preliminary review and the outcomes and conclusions stemming from the task assessments below, define and delineate the individual projects in each Proposal.

- **Task 1.2 Technical assessment and recommendation:**
  - Provide a description of- and rationale for the emissions abatement options selected and the destination/use of previously flared associated gas and/or gas recovered from fugitive emissions for each project.
  - Provide an overview of the approach, technology, and equipment to be applied for implementation of the emissions abatement solution.
  - Assess the optimality and efficiency of the selected technology/implementation approach against recommended practice, considering potential access constraints to recommended

technology and practices and recommend alternative technology and implementation options if indicated.

- Provide an initial estimate of baseline emissions and projected annual emission reduction volumes for each project's lifetime (for flare reduction in tons of CO2 per year; for gas venting and leaks reductions in tons of CH4 and CO2 equivalent -CO2e- per year).
- Identify the need for- and availability of associated facilities attached to the proposed projects, and the need for capacity expansion and or refurbishment of existing associated facilities (e.g. gathering, processing, compression, transport, etc.), if any.
- Indicate whether the operator has developed a dedicated roadmap to move toward sustainable best practices or measures to address current emissions abatement practice gaps and barriers.
- As applicable, provide baseline block flow or process flow and post-project implementation diagrams, or the description of the current practices to illustrate:
    - The rationale of the emissions abatement project
    - How the project fits into the wider facility/operations

Task 1.3 Commercial assessment and recommendation:

- Identify and describe the potential uses and commercialization options for captured gas for each of the projects, expected commercial conditions, product prices, potential impacts of inflation and currency exchange rates, commercial challenges they may face and risks they may encounter, and estimated timelines for their implementation and operationalization.
- Identify and describe any potential commercial risks and recommend possible risk mitigation measures.
- Identify any prospects for generation of carbon credits from abated methane and/or CO2 volumes and any potential monetization options.

Task 1.4 Financial assessment and recommendation:

- For each project, provide estimates of projected CAPEX, OPEX, volumes of captured gas per year, revenues, any shadow or market price of carbon if applicable.
- Develop a spreadsheet containing an annual cash flow model for the project lifetime, accompanied by documentation on applied assumptions.
- Describe the main sources of the data behind the assumptions used above, specifically:
- for CAPEX, the source of estimates (vendor quotes, similar projects, cost estimation tool, etc.), country/location factors applied, import duty applied, together with the estimated uncertainty/accuracy of the estimates.
- For OPEX, the basis for the estimates (e.g., man hours increase/reduction, parts and labor costs, fuel/electricity saving, etc.)
- For revenues (where applicable) source of the price(s) assumed.

- Cost effectiveness: The estimated volume of emissions abated per USD invested (the estimated Net Present Value of the CAPEX and OPEX of the project, minus the expected revenues from monetization of recovered gas).
- Cost efficiency: Volume of gas flaring and/or methane emissions reduced per USD deployed [tons of CO2 equivalent (CO2e) per USD].
- Provide a proposal for the structuring of the project's financial structuring package and conduct sensitivities of the recommended GMFR grant value to determine its impact on the project's financial feasibility.
- Provide a brief assessment of the financial status and stability of the project participants/ implementing entities and the associated risks, which may not directly pertain but would be of relevance to the economic and financial viability and sustainability of the project.

- **Task 1.5 Economic assessment:**
  - Provide a description and assessment of quantitative and, where appropriate, qualitative project benefits, including, e.g., (a) expected potential economic, fiscal, balance of payments, oil and gas and energy sector, environmental and social/health benefits; (b) rationale for public vs. private sector involvement/intervention/sponsorship of the project; and (c) value added of GFMR intervention and support.

- **Task 1.6 Risk assessment and recommendation:**
  - Identify and assess the potential risks faced by the projects as identified from the Tasks above, including potential past environmental or social liabilities (including historical contamination which may affect future operations, e.g., soil and groundwater contamination as a consequence of past and present operations), their potential impact on the attainment of their objectives, and recommend the appropriate risk mitigation measures.

PHASE 2: SUPPLEMENTARY PROJECT PRE-FEASIBILITY ASSESSMENT

For each project proposal, in coordination and consultation with World Bank-designated specialists in the required fields**:**

- **Task 2.1 Review of- and supplementation to Phase 1 outputs**
  - Conduct a review and, where needed, supplement and/or amend Phase 1 findings and conclusions to ensure completeness and alignment with- and integration of any suggestions and recommendations emerging from the MoPMR and World Bank review of Phase 1 deliverables.

- **Task 2.2 GHG impacts and Environmental and Social assessment:**

- Provide an estimate of the volume of direct emissions reductions for the selected projects, considering the period of baseline validity and for the project lifetime (for flare reduction in tons of CO2 per year; for gas venting and leaks reductions in tons of CH4 and CO2 equivalent -CO2e- per year).
- Describe the methodology for the baseline estimation and projected direct GHG emission reductions stemming from the project: emissions factors, direct measurement, methane content of gas volume recovered, or other methods. For flare reduction projects, the flare efficiency used, if not 98%.
- Assess environmental and social impacts (risks, costs and benefits) stemming from the project, including:
    - Local environmental impacts (e.g., impacts on local air, water, and other pollution)
    - Estimated direct social effects (e.g. employment creation, provision of capital required, foreign exchange effects)
    - Social and economic effects attributable to the project against the baseline (e.g., the communities and the number of people that will benefit from this project)
    - Estimated other social effects (e.g. training/education associated with the introduction of new processes, technologies and products and/or the effects of a project on other industries)
- Identify and assess the project's potentially significant current and future environmental and social risks and impacts of the project and associated facilities, if any, including direct, indirect, and cumulative risks and impacts. This may include but not be limited to:
    - Local environmental impacts (e.g., impacts on local air, water, and other pollution)
    - Social and economic impacts, if any, attributable to the project against the baseline (e.g., the communities and the number of people that will benefit from this project)
    - Estimated direct social effects (e.g. employment creation, provision of capital required, foreign exchange effects)
    - Estimated other social effects (e.g. training/education associated with the introduction of new processes, technologies and products and/or the effects of a project on other industries)
- Anticipate or avoid, minimize or reduce, mitigate, and/or offset or compensate any adverse risks and impacts, and determine necessary measures to address them
- Identify potential environmental and social opportunities that could enhance the environmental and social sustainability of the project.
- Provide a Paris Alignment assessment for the proposed projects.
- Conduct a review of relevant national laws and a gap analysis (in tabular format) in relation to the World Bank Environmental and Social Framework (ESF), assessing differences and providing gap-filling measures. In coordination with the MoPMR and under the guidance of the World Bank team, provide any useful input, as derived from the assignment's activities, for

preparation of the documentation to be developed by the recipient of the grant under World Bank's ESF.

- **Task 2.3 Organizational assessment:**
  - In coordination with MoPMR and the World Bank team, conduct an executive assessment of the organizational and managerial structures, preparedness and capacity of the potential grant beneficiary for the management, oversight, and implementation of the project in all its relevant aspects, including for monitoring and evaluation of activities; provide recommendations for the structuring and staffing of a Project Implementation Unit or Units (PIU) charged with providing support to the Ministry and the eventual grant beneficiary in ensuring the successful implementation of project activities.

- **Task 2.4 Procurement assessment:**
  - In coordination with MoPMR and the World Bank teams, develop a tentative project procurement plan, including estimated costs and timelines, for the procurement of any required plant and equipment, parts, project design and engineering, supervisory support, installation, testing and operationalization of the selected projects.
  - Provide input and guidance for the preparation of procurement documentation to be produced by the recipient of the grant, in line with World Bank procurement policies.

- **Task 2.5 Financial Management (FM) assessment:**
  - In coordination with MoPMR and the World Bank teams, provide recommendations to ensure that: (a) the projects' budgeted expenditures -and the proposed budgeting process itself- are realistic; (b) that project beneficiaries establish mechanism to ensure accounting records are maintained, are complete and fully traceable, and financial reports are produced and disseminated for decision-making, management, and reporting; (c) adequate funds are available to finance the Project; (d) reasonable mechanisms and control protocols over project funds are established; and (e) independent and competent project audit arrangements are in place, in line with World Bank financial management rules and financial management policies.

4. TIMETABLE

Assignment deliverables for PHASE 1: PRELIMINARY PROJECT PRE-FEASIBILITY ASSESSMENT to be completed 12 weeks after contract effectiveness.

Deliverables and timeline for PHASE 2: SUPPLEMENTARY PROJECT PRE-FEASIBILITY ASSESSMENT are contingent upon MoPMR concurrence and World Bank clearance to proceed with Phase 2.

Completion of the full, PHASE 1 and PHASE 2 assignment, including final deliverables for PHASE 2, are expected to require a total of 24 weeks from contract effectiveness.

5. METHODOLOGY

The Consultant will report to designated World Bank and MoPMR project counterparts. MoPMR and the World Bank will designate appropriate counterparts for the Consultant in Cairo and Washington D.C.

The Consultant will be expected to report to- and consult with World Bank and MoPMR counterparts as needed during the assignment's implementation through bi-weekly virtual progress meetings or as required. The Consultant will be expected to circulate a meeting agenda, as well as a prepare relevant presentation material in anticipation of progress meetings, and prepare summary minutes following each meeting.

The Consultant will be expected to work from its own office base and conduct any required consultations with MoPMR-designated staff and affiliate representatives on specific tasks as needed, through virtual and, as needed, in-person consultations to be facilitated and coordinated by MoPMR.

The Consultant should plan for at least two, in-person visits to Cairo for consultations with MoPMR counterparts and prospective project grant beneficiary representatives.

The Consultant will be expected to submit draft and final deliverable reports in English, in digital form, for review and comments to designated MoPMR and World Bank counterparts.

To facilitate the transfer of data and information from the MoPMR, the Consultant may be expected to sign a Non-Disclosure Agreement with the MoPMR in case the confidentiality provisions in the contract between the World Bank and the Consultant are deemed insufficient by the Ministry.

The Consultant will be required to prepare and submit separate technical and financial proposals for PHASE 1 and PHASE 2 of the assignment. Recognizing that the scope of PHASE 2 will be dependent on the number of projects selected based on the findings and conclusions of PHASE 1, the consultant will be expected to disaggregate its technical and financial proposal for PHASE 2 by individual project proposals.

6. DELIVERABLES

INDICATIVE TIMETABLE	
Deliverable	**Due**
1. Inception report	2 weeks after contract effectiveness

INDICATIVE TIMETABLE	
PHASE 1: PRELIMINARY PROJECT PRE-FEASIBILITY ASSESSMENT	
2. Draft report	8 weeks after contract effectiveness
3. Final report	12 weeks after contract effectiveness
PHASE 2: SUPPLEMENTARY PROJECT PRE-FEASIBILITY ASSESSMENT	
4. Draft report	18 weeks after contract effectiveness
5. Final report	22 weeks after contract effectiveness
Final Documents	
6. Final reports	24 weeks after contract effectiveness

In all cases, draft reports will be circulated to the World Bank team for review and comment prior to finalization. Following the World Bank team review, draft reports will be submitted to MoPMR for review and comments. Final sign-off of deliverables will be provided by the World Bank.
The consultant will be expected to work with the World Bank team to respond to and address any comments received during draft and final review process from the World Bank team and the MoPMR.

7. PRICE

The indicative lumpsum contract price for the assignment (Phase 1 and Phase 2) is USD 600,000.

8. KEY QUALIFICATIONS AND PROPOSAL

The World Bank will be seeking a recognized international firm with prior international experience in similar assignments, preferably with local presence in Egypt, with demonstrable experience in oil and gas sector methane emission and gas flaring reduction projects, preferably in the Middle East and North Africa region. Prior experience with oil and gas sector assignments in Egypt will be a plus.

The Consultant may associate and/or subcontract outside specialists, experts or firms to supplement its team to ensure the successful and effective completion of the assignment.

The Consultant's team should, as a minimum, include the following:

- Project management expert
- Oil and gas sector technical expert
- Economic, financial, and commercial experts in the assessment of oil and gas sector projects
- Legal and regulatory expert
- Social and Environmental impact assessment experts with experience in oil and gas industry, preferably with legal background.

The team should ideally include Arab language speaker(s). Only team members and subject experts who will have actual days allocated to the assignment should be mentioned in the proposal.

The proposal will be evaluated based on multiple criteria, including:

- Relevant prior consulting experience in the assessment of methane emission and gas flaring reduction projects.
- Prior international experience and track record of success working on similar assignments.
- Overall quality of the proposed methodology and approach to be applied to the assignment.
- Quality and relevance of prior experience of the proposed team for the assignment.
- Collective ability of the team to successfully complete and deliver the assignment in the allotted time.

9. CONFLICT OF INTEREST

The Consultant is required to disclose any potential conflicts of interest arising out of other assignments. Where the Consultant currently represents any party or potential stakeholders that would create conflict of interest or to the extent any conflict of interest would arise in the future, the Consultant shall provide a copy of its policy or procedures with respect to conflicts management (mere reference to such policy or procedure will not suffice).

In addition to the Consultant's conflict of interest and confidentiality policy, the Consultant shall detail any measures that may be required to avoid conflicts of interest and ensure the confidentiality of information received in connection with the implementation of this assignment.

ANNEX 0 – Problem Statement and Context

The Ministry of Petroleum and Mineral Resources oversees both the petroleum and mineral resources sectors in Egypt, under which 5 state-owned entities operate. These are: Egyptian General Petroleum Corporation (EGPC), Egyptian Natural Gas Holding Company (EGAS), Egyptian Petrochemicals Holding Company (ECHEM), South Valley Egyptian Petroleum Holding Company (GANOPE), and the Egyptian Mineral Resources Authority (EMRA).

All of the country's oil exploration and production operations are overseen by EGPC, while EGAS is in charge of gas exploration and production. GANOPE was set up to promote oil and gas exploration and development activities in Upper Egypt. All sector assets are owned by EGPC.

EGPC and its affiliates are keen to address gas flaring and methane emissions but require financial support to kick-start and/or accelerate these opportunities. While EGPC is a financially and operationally healthy company, subsidies for fuel and electricity place an enormous financial strain on the company. Oil and gas exports have historically been the main source of the foreign currency used to stabilize the Egyptian pound. Egypt consumes much of the oil it produces, but gas surpluses are seasonally exported to markets in Europe and Asia. However, rising domestic gas consumption, mainly for electricity, is impacting Egypt's capacity to sustain exports. Despite EGPC's healthy balance-sheet, it is unable to prioritize and guarantee the allocation of constrained resources to emissions abatement activities that are highly capital intensive and marginally economic.

For private sector joint ventures such as Khalda Petroleum Company (KPC), which is a JV between EGPC and Apache, the same investment prioritization and resource constraints apply. To meet corporate commitments towards Paris alignment, Khalda has begun development of 6 projects to reduce methane emissions from old oil tanks. The first project at the Um Baraka field recovering 6.4 million SCFD is currently in detailed design. Subject to the availability of financing, Apache and EGPC shareholders will eventually address the remaining tanks as well, but methane emissions abatement could be significantly accelerated through GFMR grant funding.

ANNEX 1 – Proposal 1: Tanks Upgrading and Installation of Vapor Recovery Systems

Objectives

The primary objective of the project Proposal is to support EGPC and its affiliates to significantly reduce methane emissions from oil storage tanks.

Description

Subject to the results of the proposed pre-feasibility study, the project will receive a grant from the GFMR trust fund. The funds will be allocated by EGPC to selected affiliates for retrofitting a series of oil storage tanks through upgrading the current single or double wiper seals to mechanical shoe seals and secondary wiper seals, or through installing vapor recovery systems.

The following tank station projects have been tentatively pre-selected (to be further detailed during the pre-feasibility study):

- Abu-Sanan Field, T-oil station operated by General Petroleum Company (GPC) – Western Desert - 10 tanks
- Gharib Oil Treatment Station operated by General Petroleum Company (GPC) – Eastern Desert – 32 Tanks.
- Gharib Offloading Terminal operated by General Petroleum Company (GPC) – Eastern Desert - 21 Tanks.
- El Hamd Oil Treatment Station operated by General Petroleum Company (GPC) – Eastern Desert – 6 Tanks.
- Um El Yusr Oil Treatment Station operated by General Petroleum Company (GPC) – Eastern Desert - 17 Tanks.
- South Bakr Oil Collecting Station operated by General Petroleum Company (GPC) – Eastern Desert - 16 Tanks.

Scope of work

The detailed scope of work for the “Tanks Upgrading and Installation of Vapor Recovery Systems” project is to be defined during- and informed by the pre-feasibility study.

For the tanks at the 5 sites at the Eastern Desert, four options for the implementation of candidate vapor recovery projects were identified (by the methane survey conducted with Carbon Limits), as follows:

1. Centralized gas gathering/ treatment:
   Installing VRU at each site, and have a central processing and treatment unit, with processed gas fed to the power generation plant.

2. Clustered gathering and utilization by GUPCO:
   Splitting the sites into two clusters - north & south, installing VRUs at each site, and transporting the gas to GUPCO gas treatment plants.
3. Clustered gathering and mitigation:
   Splitting the sites based on distance, Installing VRUs at each site, and transporting the gas to a centralized point per cluster for flare, injection or heater use.
4. Individual sites with VRUs and flares:
   Each site considered individually for installation of VRUs and connection to new and/or existing flares or furnaces.

A preliminary economic assessment was prepared for the above four options, which will be shared by MoPMR with the selected Consultant.

The anticipated cost to retrofit a tank as well as the value of the abated emissions will be dependent on the tank size and the composition of the fluids; economics will be required for each tank. The value of the abated emissions will need to be established: (i) for methane, the estimated netback value from gas export or from use/sale in the domestic market, to be agreed with the client, and (ii) for CO2, in case of flaring, the value of generated carbon credits.

An emission reduction estimate of 394,105 tons CO2e annually, quoted by the Ministry, is partly based on the results of the second emission survey, but its accuracy needs to be verified.

Expected outcomes

The expected outcome of this project is a significant reduction of methane emissions from storage tanks through the recovery of vaporized light hydrocarbons dissolved in stored crude oil or condensate—including methane and other volatile organic compounds (VOC), natural gas liquids (NGLs), hazardous air pollutants (HAP), and inert gases. Emissions volumes need to be estimated and quantified as part of the pre-feasibility study.

A potential long-term development outcome of the proposed project is an enhanced capacity of the Ministry and its affiliates to fully implement the OGMP 2.0 standard for monitoring and reporting of methane emissions from the company's distribution network.

Beneficiary

The formal Recipient of the eventual grant will be EGPC, with which a GFMR Grant Agreement will be signed. The sub-beneficiary will be General Petroleum Company (wholly owned by EGPC), as operator of the listed tank sites.

ANNEX 2 – Proposal 2: Flare Gas Recovery

Objectives

The primary objective of the project Proposal is to support EGPC to significantly reduce gas flaring. The Proposal covers five sub-projects aimed at achieving zero routine flaring and minimizing methane slip from gas flares (to less than 2% of flared gases).

Description

EGPC affiliates will undertake activities gathering currently flared APG for the generation of power for on-site requirements and to increase sales gas. The individual projects will need to be assessed to prioritize and select them for pre-feasibility based on cost, efficiency, complexity, impact, and other relevant criteria to maximize net benefits, including the value of gas previously flared, and carbon credits based on abated emissions.

Subject to the results of the pre-feasibility assessment of the project, a GFMR grant will be allocated by EGPC to affiliates for implementation of the APG recovery investments. The grant will complement financing by the affiliates' shareholders, improving project economics and accelerating APG gathering, use, and commercialization. The pre-feasibility study will inform the determination of the size of the required grant and whether the selected sub-projects should be packaged under a single grant or individual grants by beneficiary.

Scope of work

Indicative flare gas recovery projects to be considered, prioritized according to the estimated volume of flare gas, are the following:

- Kalabsha 2 site operated by KPC - 2.5 MMSCFD
- Petro Nefertiti site operated by Petro Nefertiti Company - 2.5 MMSCFD
- Shoab Ali site operated by Gulf of Suez Petroleum Company (GUPCO) at - 2 MMSCFD
- Low-pressure gases from GPY field operated by GPC in the Western Desert - 2 MMSCFD
- Western Desert Gas Complex at Egyptian Natural Gas Company (GASCO) - 1.7 MMSCFD
- T-Gas station operated by GPC in the Western Desert - 1.5 MMSCFD
- Razzak site operated by KPC - 1.5 MMSCFD
- Badr-1 site Western Desert Petroleum Company WEPCO, - 1.2 MMSCFD
- Saqqara site operated by Gulf of Suez Petroleum Company (GUPCO) - 1 MMSCFD
- Badr-3 site Badr El-Din Petroleum Company BAPETCO - 0.9 MMSCFD

The detailed scope of work for the selected individual Flare Gas Recovery projects will need to be defined during the pre-feasibility study. Economics will be required for each of the projects. The value of the abated emissions will need to be established: (i) for methane the estimated netback value from gas

export or the domestic market to be agreed with the client and (ii) for CO_2, the value of generated carbon credits.

The emission reduction of 785,000 tons CO_{2e} annually, quoted by the Ministry, is partly based on the results of the second emission survey, but its accuracy still needs to be verified.

Expected outcomes

The expected outcome of this project is a significant reduction of methane and CO2 emissions through recovery of APG that would otherwise be flared. This is estimated to be equivalent to 785,000 tons CO_{2eq} annually. This estimate needs to be verified as part of the pre-feasibility study.

A long-term development outcome of the proposed project is capacity of Client to fully implement the OGMP 2.0 standard for monitoring and reporting of methane emissions from the company's distribution network.

Beneficiary

The formal Recipient of the grant will be EGPC, with whom a Grant Agreement will be signed. Other beneficiaries are General Petroleum Company, Khalda Petroleum Company, Petro Nefertiti Company, Gulf of Suez Petroleum Company, Egyptian Natural Gas Company, Western Desert Operating Petroleum Company, Badr El-Din Petroleum Company, and Shukheir Oil Company, with which EGPC will sign Subsidiary Agreements.

ANNEX 3 – Proposal 3: Gas Flaring Measurement (GFM) Program

The unavailability of flare measurement equipment and of accurate flaring volumes across oil and gas sector facilities represents a persistent challenge for the MoMPR and its affiliates.

Objectives

The objective of this project Proposal is to quantify and monitor the amount of gas that is flared at oil and gas facilities, thus reducing greenhouse gas emissions, improving operational energy efficiency, and enhancing environmental sustainability, essential for regulatory compliance and environmental protection.

The proposed Flare Measurement program (GFM) includes the following:

- Installation of hot tapping flow meter connections (1.5'') with ball valves for 77 existing flares.
- Installation of permanent industrial thermal flow meters for flares exceeding 0.7 MMSCFD (25 existing flares), including supply, installation, and commissioning.

The flare measurement phase will be managed by Alexandria Petroleum Maintenance Company (Petromaint), an EGPC affiliate company that provides a large array of services and solutions to Oil & Gas Upstream and Downstream Facilities.

The GFM program will inform the identification of opportunities and prospects for additional projects for implementation of flare gas recovery projects, based on actual measured flare gas volumes.

Project description

Subject to the conclusions of the pre-feasibility assessment, the project will receive a grant from the GFMR trust fund. EGPC will be the Recipient of the grant. EGPC will allocate these funds to the Alexandria Petroleum Maintenance Company (Petromaint) to perform the required measurements and install the industrial meters.

Scope of work

The detailed scope of work for the "Methane Leak Detection and Repair (LDAR) Program" project needs to be defined during the pre-feasibility study. The preliminary scope includes installation of piping provisions that will allow for periodic flare metering using mobile metering devices, as well procurement and installation of permanent thermal flow meters for continuous measurement of flared gas volumes.

Expected outcomes

This program will allow accurate and periodic measurement of the quantities of flare gas volumes across oil and gas facilities. It will also help in identifying opportunities and prospects for additional projects for implementation of flare gas recovery, based on the actual flare gas volumes that will be measured.

Beneficiary

The formal Recipient of the grant will be EGPC, with whom a Grant Agreement will be signed. The beneficiary of the grant will be the Alexandria Petroleum Maintenance Company (Petromaint).

ANNEX 4 – Proposal 4: Methane Leak Detection and Repair (LDAR) Program

Objectives

The primary objective of the Methane Leak Detection and Repair (LDAR) Program is to identify, measure, prioritize, select, and repair methane leaks in the oil and gas sector value chain to reduce greenhouse gas emissions, improve operational efficiency, and enhance environmental sustainability.

Description

The identification, measurement, prioritization and selection of projects to address fugitive methane emissions requires the establishment of a baseline across the oil and gas sector infrastructure network, as well as verification of the post-abatement activity effectiveness of interventions. This is also a requirement to fully implement the OGMP 2.0 standard for monitoring and reporting of methane emissions from the network and to apply for carbon credits. The capability to perform these measurements in Egypt is currently limited.

Subject to the conclusions of the pre-feasibility assessment, the project would receive a grant from the GFMR trust fund. EGPC will be the Recipient of the grant. EGPC will allocate these funds to the Center of Excellence for Energy Transition (COEET).

The project focuses on setting up a team in COEET to detect and measure methane emissions as a service for the oil and gas sector in Egypt. The funding would go (1) towards purchasing high accuracy detection and measuring equipment, (2) conducting 3-4 pilot LDAR projects in sites selected through the pre-feasibility assessment, and (3) building institutional capacity to sustain and replicate those efforts.

It is intended that COEET will provide services to all oil and gas affiliate companies in Egypt's petroleum sector to measure baseline emissions, as well as the post-abatement activity measurements required for MRV.

The following indicative sites have been selected for the implementation of pilot LDAR projects:

- GASCO, Amerya LPG Recovery plant (maximization section)
- EGPC, Ras Shukheir Gas Plant Unit 104
- SUCO, Zeit Bay Gas Plant

Scope of work

The detailed scope of work for the “Methane Leak Detection and Repair (LDAR) Program” project Proposal needs to be defined during the pre-feasibility study. During the Bank visit in November 2024 a high-level scope for the project was discussed and includes the following:

1. Detection equipment: Selection and procurement of equipment and tools, including infrared cameras for the detection, measurement and monitoring of methane leaks.
2. Quantification and reporting:
   - Measurement tools: identify and adopt accurate measurement tools/methodologies to quantify the volume of methane emissions from detected leaks.
   - Data management: Develop systems for recording and reporting methane emissions data, ensuring transparency and accountability.
3. Repair and Maintenance:
   - Repair protocols: Establish standardized protocols for repairing detected leaks. Note that actual repair activities will be performed by the operator of the facility.
   - Maintenance Programs: Implement routine maintenance programs to prevent future leaks and ensure the integrity of infrastructure.
4. Capacity building and training:
   - Training Programs: Conduct training sessions for technical staff on leak detection technologies, repair techniques, and data management.
   - Workshops and Seminars: Organize workshops and seminars to raise awareness about the importance and benefits of methane leak detection and repair among industry stakeholders.
5. Implementation of LDAR pilot projects
   - In consultation with MoPMR and its affiliates, support the identification and selection of 3-4 sites for the implementation of pilot methane LDAR projects with GFMR grant support.
   - Provide theoretical training and technical support to the Center of Excellence for Energy Transition (COEET) personnel to conduct 3-4 LDAR campaigns in selected sites, including ‘on-the-job’ training for baselining of emission volumes, during detection and measurement activities, and for post repair verification.

The anticipated emission reduction of 9,000 tons CO2e annually, quoted by the Ministry, is based on the assumption of a 40% reduction of methane emissions based on typical impacts of LDAR campaign, but the accuracy of estimates needs to be verified.

Expected outcomes

The expected outcome of this project is a significant reduction of methane emissions through the execution of pilot and future LDAR campaigns. This needs to be quantified as part of the pre-feasibility study.

A potential long-term development outcome of the proposed project is building capacity of Client to fully implement the OGMP 2.0 standard for monitoring and reporting of methane emissions from the country's oil and gas network.

Beneficiary

The formal recipient of the GFMR grant will be EGPC, with which a Grant Agreement will be signed. The beneficiary is the COEET.