



## Methane Abatement in the Oil and Gas Sector: Leak Detection and Repair



This fact sheet presents findings for the implementation of Leak Detection and Repair (LDAR) programs from a broader study assessing the costs and financial implications of four methane abatement measures across nine countries in Africa and Latin America. Estimates of abatement potential and mitigation costs are developed at the country level, accounting for real-world constraints including existing policy frameworks, ease of deployment, and prevailing industry practices. The study aims to support regulators in designing appropriate incentives and policies to guide and prioritize the deployment of abatement technologies.

The full report, published in June 2026, is available via the QR code.



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### Overview

LDAR programs are designed to identify and repair fugitive methane emissions from equipment components such as connections, open-ended lines, and valves. It can be implemented using a range of technologies, including Optical Gas Imaging (OGI) cameras, laser-based sensors (e.g., Tunable Diode Laser Absorption Spectroscopy), and ultrasonic leak detectors. These technologies can be deployed on various carriers including fixed monitoring stations, handheld devices, vehicle-mounted systems, drones, aircraft, and satellite-based instruments. As each of these technologies and deployment method presents advantages and limitations, selecting the most appropriate combination depends on site characteristics and equipment configuration.

The effectiveness of LDAR increases with inspection frequency, with assumed emission reductions of 40% (annual), 60% (biannual), and 80% (quarterly)<sup>1</sup> compared to not having regular LDAR in place.

This study focuses on ground-based OGI surveys conducted at different frequencies (annually, semi-annually, and quarterly). OGI detects methane based on its absorption of infrared radiation at specific wavelengths. This absorption creates an apparent temperature contrast between the gas plume and the background, allowing leaks to be visualized in real time. OGI is the most widely used leak detection technology globally. The analysis considers a hybrid implementation model, with half of surveys conducted in-house (requiring equipment procurement and internal team training) and half carried out by external service providers (local or international).

<sup>1</sup> United States Environmental Protection Agency. (2015). *Oil and Natural Gas Sector: Standards for Crude Oil and Natural Gas Facilities*. Available at: [https://gaftp.epa.gov/air/nei/2017/doc/supporting\\_data/nonpoint/EPA\\_2015b\\_NSPS%20OOOa%20TSD%20August%202015.pdf](https://gaftp.epa.gov/air/nei/2017/doc/supporting_data/nonpoint/EPA_2015b_NSPS%20OOOa%20TSD%20August%202015.pdf)

## Costs range

The table below presents LDAR costs under two models: in-house implementation and outsourcing of detection. In-house campaigns include capital expenditure (CAPEX), such as equipment and training, and operating expenditure (OPEX), such as labor and maintenance for detection and repair. When detection is outsourced, CAPEX is avoided, and OPEX includes contractor fees for detection only, with repairs assumed to be performed internally. A 50/50 split is assumed in this study.

	Internal		Operating Costs - Repair	External
	Capital Costs	Operating Costs - Detection		Operating Costs - Detection
Per set of equipment/team	\$100,000 - \$500,000	\$0 - \$100,000	\$100,000 - >\$1,000,000	\$100,000 - \$1,000,000

*Cost estimates are indicative and may vary significantly depending on site conditions, local market conditions, labor and logistics costs, regulatory requirements, import fees, supply chain availability, and project-specific factors (e.g., scale, location, and existing infrastructure). This table does not include benefits (e.g., savings from avoided gas losses, gas sales, or avoided penalties).*

Costs are presented per team (one equipment set per team). It is assumed that a single team can conduct 14 to 20 campaigns per year, with each campaign lasting around 1 to 2 weeks, depending on site complexity and location.

Per-team costs are similar across inspection frequencies, but total costs increase at higher frequencies as more teams are required. Repair costs also increase with inspection frequency: more frequent surveys detect more new leaks, leading to a higher number of repairs and, consequently, higher total repair costs. In this analysis, all repairs are assumed to be carried out by internal teams. However, savings from avoided gas losses represent economic benefits that are captured in the net costs used to develop the MACC but are not reflected in this table.

## Current policies and practices

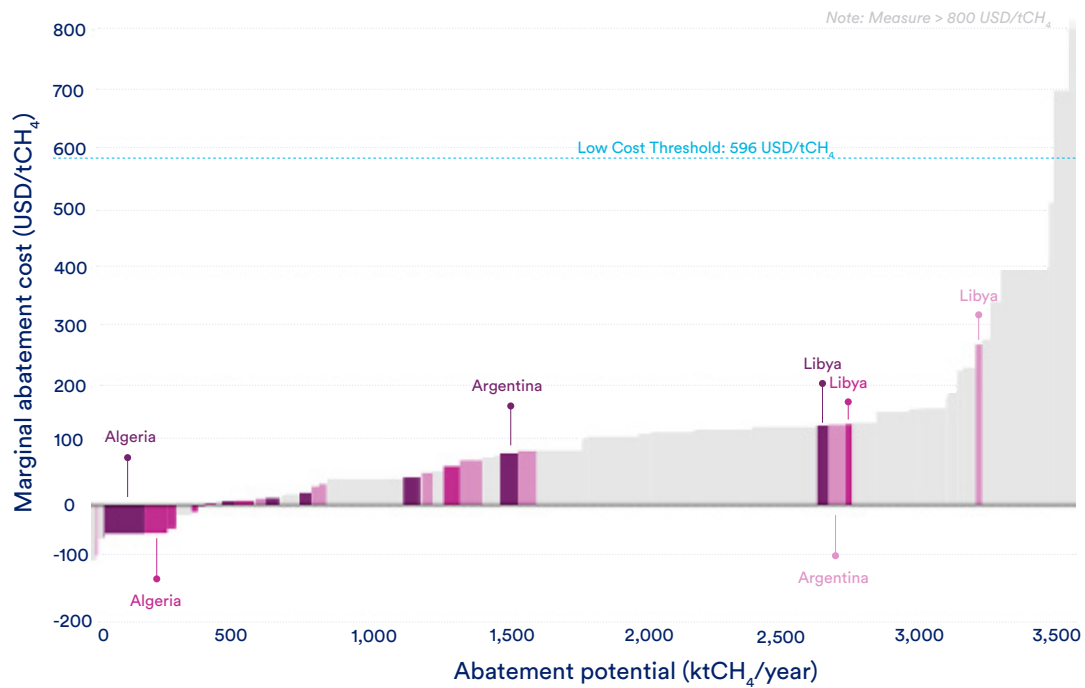
The table below presents the current status of regulatory frameworks and mitigation practices related to LDAR.

	Algeria	Angola	Argentina	Brazil	Egypt	Ghana	Libya	Mexico	Nigeria
Regulation in place	N	N	P	N	N	Y	N	Y	Y
Current practices	L	M	M	M	L	M	L	M	M

Regulation ■ Y – Yes (National) ■ P – Partial (Subnational) ■ N – No  
 Practices ■ H – High adoption ■ M – Medium adoption ■ L – Low adoption

*For further details, please refer to the individual country fact sheets.*

## Marginal Abatement Cost Curve for Selected Mitigation Options



### Abatement options



### Notes:

- In this marginal abatement cost curve (MACC), abatement options are disaggregated by country and abatement options. Marginal abatement costs are aggregated at the country–technology level using a weighted average based on abatement potential, combining different segments (e.g. upstream, midstream) and locations (e.g. onshore, offshore).
- To avoid double-counting emission reductions, the net costs and the volume of emissions reduced were calculated incrementally. The biannual LDAR option reflects the additional cost and emission reduction beyond those achieved through annual inspections. Similarly, the quarterly option reflects the incremental cost and emission reduction relative to biannual inspections. Each segment of the MACC therefore represents the marginal benefit of increasing inspection frequency, rather than cumulative totals.

Based on emissions data from International Energy Agency (2025) Methane Tracker Database - IEA; as modified by Carbon Limits/CATF

## Analysis

LDAR measures, regardless of inspection frequency, can deliver a wide range of abatement potentials and may result in both positive and negative marginal abatement costs. This reflects the balance between implementation costs and revenues from recovered gas, with all options remaining well below the low-cost threshold of 596 USD/tCH<sub>4</sub> (20 USD/tCO<sub>2</sub>e). Two main patterns emerge:

- **High potential, low or negative cost contexts**, driven by a high share of salable gas and limited import-related costs for equipment and services. In countries such as Algeria, this results in significant abatement potential at negative cost, although deployment is not always supported by strong regulatory incentives.
- **Lower potential, higher cost contexts**, where high import costs, administrative barriers, and reliance on expensive external service providers reduce cost efficiency. Limited access to local expertise and equipment (e.g., OGI cameras, drones) further increases costs in countries such as Argentina and Libya.

It is also worth noting that marginal abatement costs are estimated based on baseline emissions from the IEA (Fugitive Leaks category). Satellite-detected emissions are not included, although some may correspond to large fugitive sources, potentially leading to an underestimation of abatement potential.

Overall, abatement costs are not directly proportional to emission reductions. They are strongly influenced by the share and value of salable gas, local market conditions, import constraints, and prevailing industry practices.

## Challenges and barriers to wider deployment

- **Limited access to local trained personnel.** In some countries (e.g. Libya, Argentina), there is a lack of local service providers and technical capacity for in-house implementation. Domestic operators may have lower awareness or experience with LDAR, resulting in fewer campaigns. Partnerships with international oil companies have enabled pilot initiatives, the ability to scale these efforts remains uncertain.
- **Operational and logistical constraints.** LDAR implementation requires site access, coordination, and repeated inspections. Remote locations, security constraints, and complex operating environments can delay or limit deployment (e.g., Argentina), often resulting in lower inspection frequencies, particularly offshore.
- **High costs and reliance on imports.** LDAR programs involve upfront investment in detection technologies (e.g., OGI cameras, drones) and ongoing operational costs. In some contexts, dependence on imported equipment, sometimes associated with high costs and administrative burdens (e.g., Libya), and foreign service providers further increase costs and create additional logistical barriers.

Clear regulatory signals can significantly reduce these barriers to deployment, increase local capacity, streamline logistical challenges, and support upfront investments.

*Disclaimer: The figures presented in this fact sheet are based on national-level estimated data and analytical assumptions from 2025. Actual emissions, abatement potential, and costs may vary due to data limitations, site specific conditions, operational constraints, and cost structures. This document is intended for informational purposes only and should not be relied upon as the sole basis for investment, operational, or policy decisions. Regulators are invited to reach out to CATF for further discussions on understanding the assumptions underlying the cost curves and for guidance on the adoption and implementation of methane regulation.*