Leak Detection and Repair (LDAR)

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About the Handbook

A ‘how-to’ action guide to empower legislators, ministries, regulators, and NOC officials to adopt and enforce legal instruments that will rapidly and effectivel reduce methane emissions from the oil an gas sector.

Available here:

https://cldp.doc.gov/methane-abatement-resources

Methane Abatement for Oil and Gas: Handbook for Policymakers

About the Handbook (continued)

- Sponsored by **U.S. Department of State, Bureau of Energy Resources.**
- Drafted over one week in an intense session with 13 expert co-authors.
- Co-written by authors representing:
  - Government (U.S., Sri Lanka, and Bangladesh)
  - NGOs
  - Multilaterals
  - Industry
  - Academia

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Leak Detection and Repair (LDAR)

Key Takeaways

Leak Detection and Repair (LDAR) programs are designed to identify and address unintended or fugitive emissions from equipment.

LDAR requirements can be implemented without extensive data on or specific measurements of the level of fugitive emissions.

Important design features of LDAR regulations include:

- Scope of facilities to be inspected.
- Detection technologies to be used and detection threshold to set.
- Frequency of inspections.
- Repair requirements, including deadlines.
- Reporting, recordkeeping, and certification.

Canada's federal LDAR regulation is discussed as an illustration of these design features.

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Overview

- Fugitive emissions, or leaks, are **unintentional losses of methane**. They can occur at several connection points, like valves, throughout the value chain.
- Collective methane emission rates from fugitive emissions are one of the **largest sources of emissions** from the oil and gas sector.
- **LDAR programs** involve **periodic on-site surveys** by qualified personnel. If leaks are detected, the operator is required to fix those leaks within a specified time period. Operators are generally required to document the LDAR process and report regularly to the government.
- **LDAR programs do not require robust upfront methane emission data to function**. Operators can begin conducting leak detection surveys and fixing leaks, which leads to methane reductions, even before extensive data is collected. However, data compiled by operators during LDAR programs, such as the type and frequency of certain leaks, can be valuable information to help inform future actions.

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LDAR Regulation Features (1)

Several design considerations, discussed in the next six slides, affect the effectiveness of LDAR programs.

Scope of Inspected Facilities

- LDAR requirements can **specify which facilities** must be inspected. Smaller facilities may be excluded or have different requirements. The frequency of surveys may be lower for very remote facilities. LDAR programs may include exceptions for components designated as unsafe to monitor.

- **Leaks can occur at all types of facilities**, whether large or small. A program focused on a subset of emission sources may address fewer leaks but be more cost-effective. If a regulation covers only a subset of sources, covering the sources most likely to leak will be essential.

Figure 5.1: Features of LDAR regulation.

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LDAR Regulation Features (2)

Detection Technology and Detection Threshold

- LDAR regulations may require **specific methods or technologies to conduct the source survey**
  - *e.g.*, audio, visual, and olfactory (smell) inspections (AVO)
  - various portable monitoring instruments, or
  - optical gas imaging (OGI) cameras).
- There may be additional technical and operational requirements, such as specific detection thresholds, for instruments and OGI cameras. However, LDAR regulations might not necessarily require quantifying individual leaks beyond whether they are above the detection threshold.
- AVO inspections are inexpensive as they are grouped among other routine duties at a facility and do not require special equipment. They are most effective at detecting leaks at sites with simple equipment (like wellheads) and low noise levels. OGI cameras are more effective at detecting leaks.

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LDAR Regulation Features (3)

Detection Technology and Detection Threshold - Continued

- Given the different detection options some regulators have incorporated the approaches from other jurisdictions in their regulations. For example, many jurisdictions already refer to the **EPA's instrument detection standard**, EPA Method 21.
- There is an ongoing discussion over **how to ensure that LDAR regulations encourage innovation and development of advanced technologies**, such as aerial surveys from airplanes or drones, satellites, and continuous monitoring.
- Some jurisdictions have created processes for operators to petition to use an alternative approach if they can demonstrate that the alternative can achieve at least the same level of emission reductions as specified detection technologies.

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LDAR Regulation Features (4)

Frequency of Inspections

- The **frequency of inspections** (annual, quarterly, etc.) influences the emission reduction potential of an LDAR program.
    - More frequent surveys lead to faster detection and repair of leaks but at an added cost. At some point, additional surveys can reach a point of diminishing returns.
- One source of guidance on survey frequency and measurements is **MiQ**, a methane emissions certification standard.

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LDAR Regulation Features (5)

Repair Requirements

- LDAR regulations can require companies to repair any leaks detected during the periodic surveys.
- The regulation can require a specific timeline for these repairs (*e.g.*, 30 days, possibly longer for complex repairs). A shorter repair deadline ensures leaks are repaired more quickly, but can have operational implications for facilities.
- Some regulations state that if a repair can be made without shutting down the facility, repairs are required in a short time frame, such as 30 days, but allow a longer time frame for repairs that necessitate a full shutdown.

Figure 5.1: Features of LDAR regulation.

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LDAR Regulation Features (6)

Reporting, Certification, and Auditing

- LDAR regulations can require companies to keep records of their leak detection surveys, detected leaks, and repair actions. These can be done through specified templates or an online reporting tool. These reports may include:
  - Date of the survey.
  - Type of detection instrument.
  - Details on the source surveyed (location, type of facility).
  - Information on any leaks detected (type of component, type of service, etc.).
  - Action taken on repairs, including dates.
  - The outcome of repairs, including follow-up surveys.

- Some regulations require that LDAR reports be certified or audited by a third party. This practice can aid the regulator in ensuring that reports are complete and accurate, with additional administrative burdens on operators.

Figure 5.1: Features of LDAR regulation.

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Case Study: Canada's Federal LDAR Requirement (1)

In 2018, the Canadian federal government established a national LDAR requirement featuring many of the considerations discussed above.

Scope of Inspected Facilities

- Canada's regulation only applies to large facilities, generally covering all upstream oil and gas facilities, including well pads and compressor stations, that produce or handle more than 60,000 m3 of natural gas annually. Section 28(1) of the regulation also explicitly excludes certain pieces of equipment from the LDAR requirement:
- *Section 28 (1) Sections 29 to 36 do not apply in respect of*:

  (a) an equipment component used on a wellhead at a site at which there is no other wellhead or equipment except for gathering pipelines or a meter connected to the wellhead;

  (b) a pair of isolation valves on a transmission pipeline if no other equipment is located on the segment of the pipeline that may be isolated by closing the valves; and

  (c) an equipment component used at an upstream oil and gas facility whose inspection would pose a serious risk to human health or safety.

- By specifying the exempted facilities, equipment, or circumstances, Canada's regulations focus the inspections on the sources of leaks that are most important to achieve meaningful reductions. For example, because leaks often occur from components or equipment at a facility, wellhead-only sites with few components and no other equipment (e.g., storage tanks, compressors, etc.) are exempted because of a lower probability of leaks. Similarly, isolation valves on transmission pipelines are exempted in (b) because the emission potential from these components at these facilities is low. The third exemption at (c) covers any instance where the inspection could pose a risk to human health or safety, providing less clarity on where it would apply.
- Exemptions can reduce burdens on operators but may miss significant methane emissions and burden the regulator to address exemption requests.

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Case Study: Canada's Federal LDAR Requirement (2)

Detection Technology and Detection Threshold

- Canada requires instrument-based inspections. It specifies two instruments that are eligible for use:
  - (1) portable monitoring instruments that meet certain operational and calibration specifications and
  - (2) OGI instruments capable of meeting specific detection requirements.
- Section 30(2) provides that a portable monitoring instrument must comply with EPA's Method 21 in its specification, application, and calibration. For OGI cameras, the regulation sets a concentration threshold of "at most 500 ppm [by volume] and at a flow rate of at least 60 [grams/hour] leaking from an orifice that is 0.635 centimeters in diameter." It also includes requirements regarding the viewing distance.
- Requiring the use of these instruments can entail training and equipment costs but can detect leaks that AVO methods would miss. By referencing existing specifications from another regulator, the Canadian rule avoids the need to develop a detailed technical standard while ensuring consistency for those operators that must comply with the same specifications in their jurisdictions.

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Case Study: Canada's Federal LDAR Requirement (3)

Detection Technology and Detection Threshold - Continued

- The Canadian regulation allows operators to establish an alternative LDAR program so long as it "results in at most the same quantity of those fugitive emissions as would result from" an LDAR program in line with the regulation. The regulation also provides that an alternative program must have the following elements:

  (a) the inspection for leaks;
  (b) the operation, maintenance, and calibration of leak detection instruments, if applicable; and
  (c) the repair of leaks detected.

- This flexibility allows an operator to use an instrument not directly listed under the regulations or to inspect with different frequencies. Using an alternative program places the burden on the operator to demonstrate program effectiveness with supporting documents that must be submitted to the regulator.

Case Study: Canada's Federal LDAR Requirement (4)

Frequency of Inspections

Canada's regulation specifies the timeframe for initial and subsequent inspections:

- *30(3) The period for inspections is as follows*:

  (a) for the first inspection, on or before the later of May 1, 2020, and the day that occurs 60 days after the day on which production at the facility first began; and

  (b) for subsequent inspections, at least three times per year and at least 60 days after a previous inspection.

- For example, a new facility would be required to perform an LDAR inspection within 60 days after the first day of production and then at least three times per year at each facility with at least 60 days between inspections. This frequency allows operators to determine the best inspection schedule across multiple facilities within the limits of the regulation.

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Case Study: Canada's Federal LDAR Requirement (5)

Repair Requirements

- Canada's regulation requires that detected leaks be repaired. The deadline for repair varies depending on the ease of making the repair. Where a repair can be made while the component operates, the operator must make the repair within 30 days:

  32 (1) A leak from an equipment component that is detected, whether as a result of an inspection or otherwise, must be repaired.

  (a) if the repair can be carried out while the equipment component is operating, within 30 days after the day on which it was detected.

- However, if a repair would require a shutdown, the repair can be carried out during the next planned shutdown:

  (b) in any other case, within the period before the end of the next planned shutdown unless that period is extended under section 33.

- The regulation further specifies that the deadline for making the next planned shutdown is based on the relative size of the leak compared to the emissions that would be emitted in the process of repairing:

  (2) The next planned shutdown must be scheduled not later than the date on which the estimated volume of hydrocarbon gas, expressed in standard m3, that, beginning from the day on which the leak is detected, would if no repairs are made be emitted from the leaking equipment component in question and from all other equipment components that are also leaking as of that day is equal to the volume of hydrocarbon gas, expressed in standard m3, that would be emitted due to purging of hydrocarbon gas from equipment components to repair.

- In other words, because shutting down and repairing components may require venting the gas inside the component, the repair must be scheduled before the cumulative emissions from the leak exceed the anticipated emissions the shutdown would cause. This approach allows flexibility for companies to schedule the repair while providing limits to ensure that the leak does not continue indefinitely.

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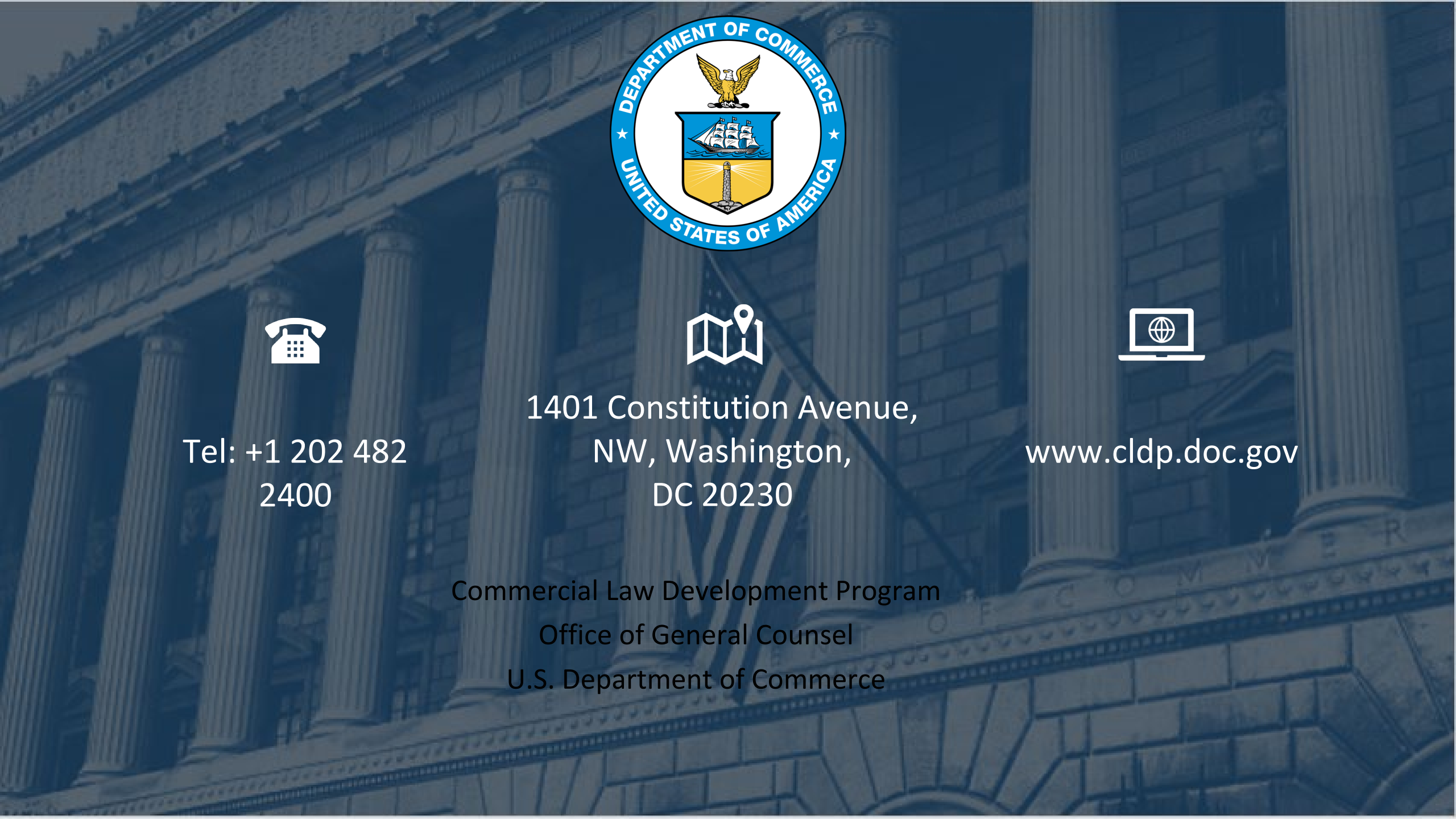
Case Study: Canada's Federal LDAR Requirement (6)

Reporting, Certification, and Auditing

- The Canadian regulation requires operators to create and keep records and supporting documents, including:
  - *Each calibration of inspection instruments;*
  - *Date of inspections;*
  - *The type and location of the equipment with GPS coordinates;*
  - *The type of instrument used;*
  - *In the case of OGI, images were recorded with embedded indications of data and time;*
  - *Leaks that were detected and documentation of steps taken to repair leaks*

- Canada requires that these records must be created within 30 days following when the information becomes available, be submitted within 60 days upon request, and be retained by the operator for 5 years. This approach reduces the ongoing administrative burden on the regulator while ensuring they have access to information as needed.
  - Failure to comply with this regulation's reporting or other provisions can subject an operator to monetary penalties.



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