

Mastering the EU Methane Regulation: Challenges & Solutions

Energy Community Webinar
An hour for knowledge, knowledge for future
September 25, 2024

Federico Noris
Innovation Lead & Project Manager

Four Distinct Service Lines



Inspection Services

Advanced inspection services for challenging pipelines and furnaces, using UT, MFL, and/or robotic technology.



Environmental Services

Global field emission measurements combined with expert knowledge and advice.



Pipeline Management

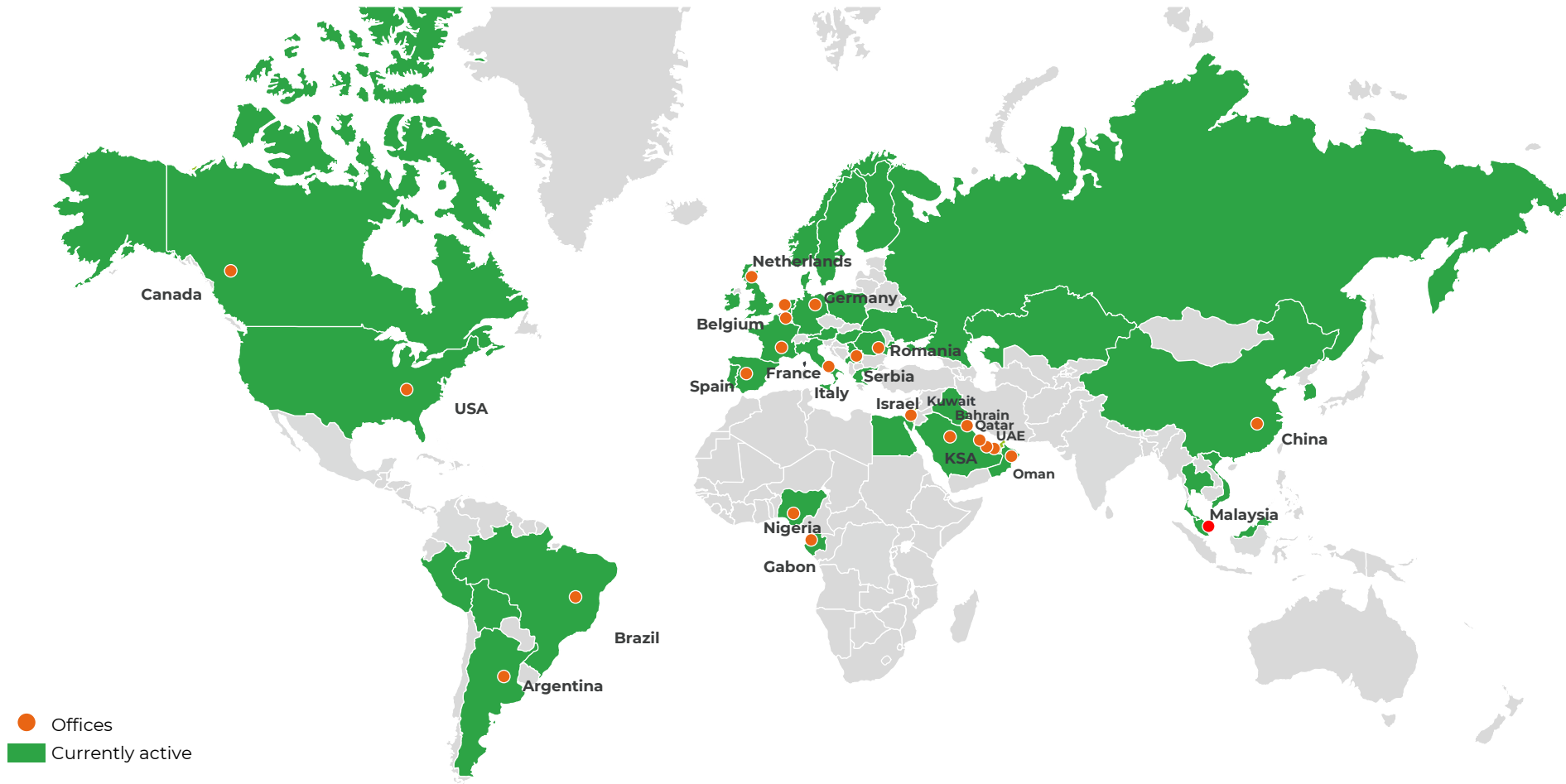
Maintaining high integrity levels of your buried pipelines, right down to detecting even the smallest leak and upcoming corrosion.



Industrial Services

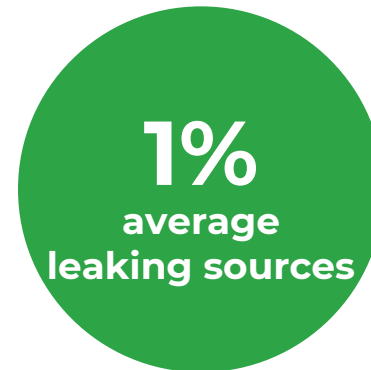
Downstream cleaning (refinery, petrochemical); nitrogen-related industrial cleaning including reactor cooling, system purging, furnace cleaning, and chemical cleaning solutions.

We support clients globally



Achievements and results

Emission monitoring



Clients for Environmental Services



Clients



Agenda

1. EU Methane Regulation

- Overview of EU Methane Regulation
- Dissecting the different articles →
- Open points

2. LDAR

- Approaches
- Challenges
- Proposed solutions

3. MRV

- Approaches
- Challenges
- Proposed solutions

- Introduction of the Regulation
- Article 12 Monitoring, Reporting and Verification (MRV)
- Article 14 Leak Detection And Repair (LDAR)
- Article 14 LDAR for underground pipelines
- Article 15 Venting and Flaring
- Article 18 Wells
- Article 27-29 Importers
- Repair and Remeasurements
- Reporting requirements
- Deadlines to hit

1. EU Methane Regulation

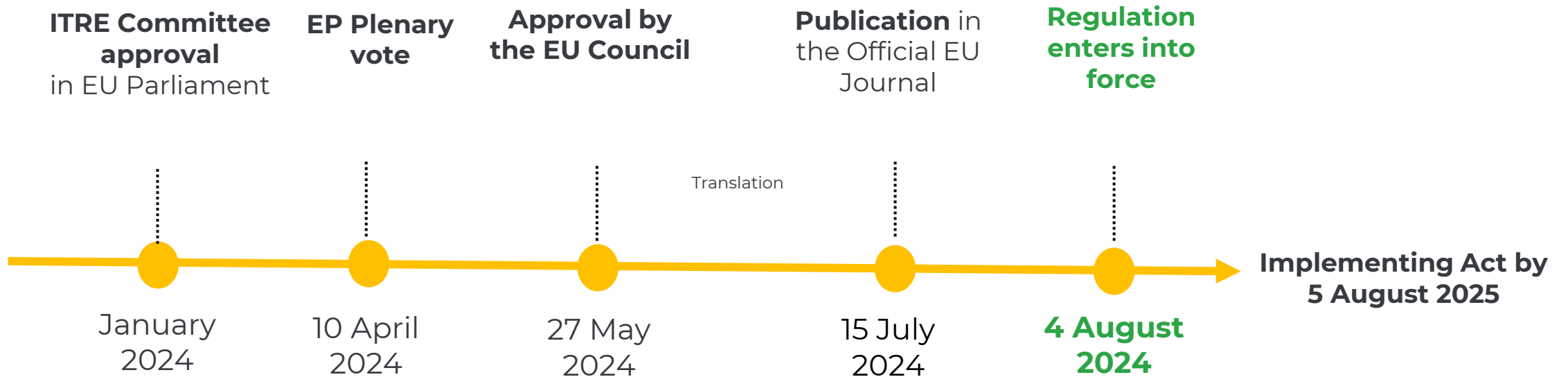
Overview

Different articles

Open points



The EU Methane Regulation has entered into force



Scope

- Focus on **measurement, quantification, monitoring and reporting**
- **Regulation applies to energy sector in EU. More specifically:**
 - O&G exploration,
 - production,
 - gathering and processing,
 - wells,
 - storage,
 - gas transmission and distribution (no metering at final consumption points and the lines between the distribution and the property of final customers)
- **Enforced also for imported oil & gas**, in a later stage (from 2027)

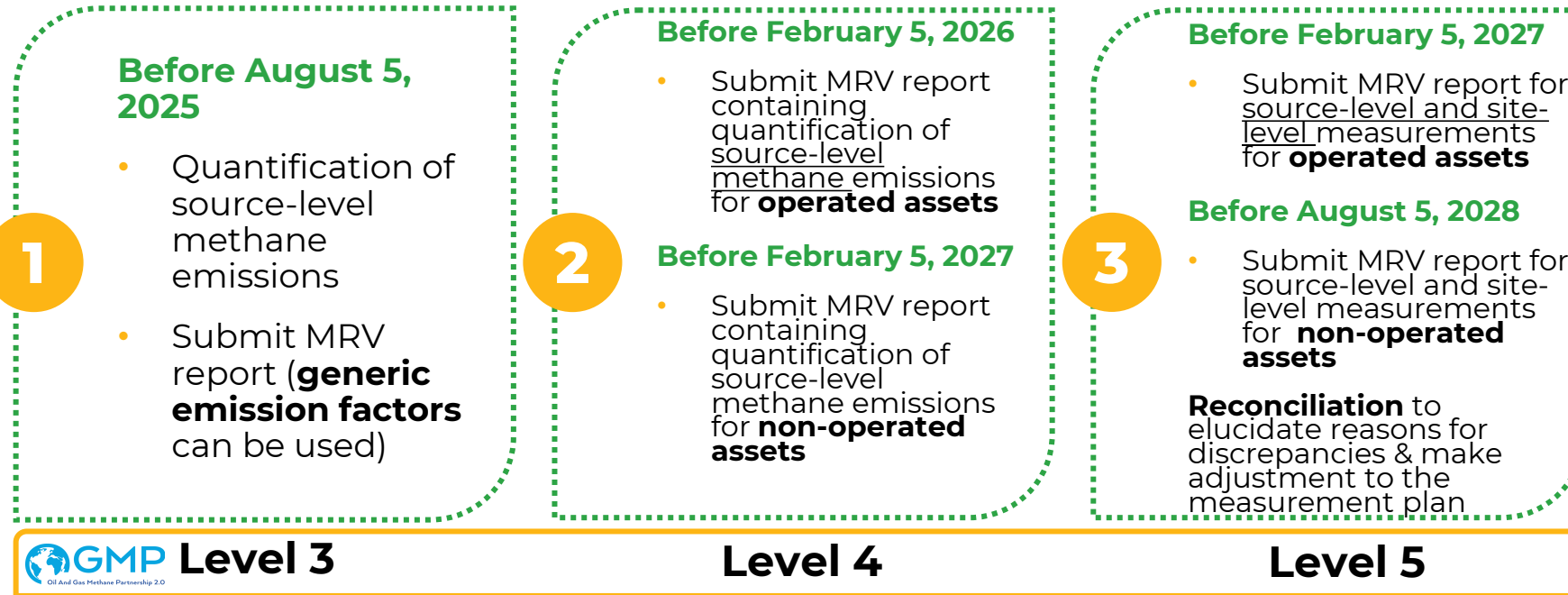


General principles

- **Following OGMP** approach for MRV (also evolving and not static)
- **Ban venting & routine flaring**, with exceptions
- Focusing on traditional approach with **possible use of advanced technologies***
- **Repair leaks very quickly**
- **Remeasure leaks soon**



Article 12: MRV



- Require complete **inventory** (fugitive and non-fugitive) of all sources
- Subsequently **measurements and report every May** (e.g., 31 May 2028)
- Use **Best Available Techniques** based on **OGMP Guidance Documents**
- **Reporting template** coming by August 5, 2025 (Implementing Act) based on OGMP
- Verified by **verifier** (accredited by a national accreditation body)

Article 14: LDAR

- **Before May 5, 2025:**
 - **Submit LDAR program** to your authorities including:
 - description of the LDAR surveys with relevant standards and methodologies used
 - specific timelines
- **Before August 5, 2025:**
 - **Complete** your **initial LDAR Type 2 program**
 - Surveys conducted in last 2 years (from August 3, 2022) are accepted
- Operators can **choose** to perform **LDAR Type 2 instead of LDAR Type 1**, when LDAR Type 1 is due.
- You **can use advanced technologies** if:
 - approved by competent authority
 - the technology measures at individual source level
 - Minimum Detection Limit (MDL) is met
- **Yearly LDAR report** (May?) with schedule, repairs and summary of results for previous year (Annex II)
- Competent **authorities can exempt offshore** at water depth >700m if demonstrate impact is negligible



Article 14: LDAR

Measurement frequencies and Minimum Detection Limits

Submitting LDAR programme to CAs Art.14(1)	9 months: existing sites 6 months: new sites (from the date of start of operations)									
Initial LDAR survey Art.14(2)	First Type 2 LDAR survey of all components carried out by: <ul style="list-style-type: none"> • 12 months for existing sites • 9 months for new sites 									
Segmentation of components Art.14(2) & Annex I	Aboveground (detection at a level as close as possible to each individual potential emission source)		Underground (detection at interface between ground and atmosphere)		Distribution and Transmission (detection at interface between ground and atmosphere)		Offshore (detection applying the best commercially available detection techniques)		Others	
Frequency (every x months) Annex I	Compressor station, underground storage, LNG-terminal, regulating and metering station	Type 1: 4 Type 2: 8	Bitumen sheet, grey cast iron	Type 1: 3 Type 2: 6	Compressor station, regulating and metering station (design pressure >16 bar)	Type 1: 4 Type 2: 8	Above the sea level	Type 1: 12 Type 2: 24	Type 1: 6 Type 2: 12	
			Asbestos, ductile cast iron	Type 1: 6 Type 2: 12	Valve station (design pressure >16 bar)	Type 1: 9 Type 2: 18				Below the sea level
					Valve station	Type 1: 9 Type 2: 18	Regulating and metering station (design pressure ≤16 bar)	Type 2: 9		
	Non-protected steel, copper	Type 1: 9 Type 2: 18	Valve station (design pressure ≤16 bar)	Type 2: 21			Below the seabed	Type 1: 36		
			Polyethylene, PVC, protected steels	Type 1: 15 Type 2: 18 (30 for protected steel)						Grey cast iron, bitumen sheet
	Polyethylene, PVC, protected steels	Type 1: 15 Type 2: 18 (30 for protected steel)			Asbestos, ductile cast iron	Type 1: 6 Type 2: 12	Offshore components located at water depth >700m exempt, if robust evidence can be provided that the impact on the climate of potential emissions from those components is highly likely to be negligible.			
Polyethylene, PVC, protected steel			Type 1: 12 Type 2: 24	Type 1: 24 Type 2: 36						
Minimum detection limits (MDLs) Art.14(3)	By 12 months, EC to develop Implementing Acts specifying: <ul style="list-style-type: none"> • MDLs and detection techniques to be employed for the different detection devices to be used for meeting the requirements specific to all components in Art.14(4) (i.e. repair thresholds) • Use of best available technologies and detection techniques until Implementing Act developed 									
Leak repair thresholds Art.14(4)	<ul style="list-style-type: none"> • In case of type 1 leak detection and repair surveys: 7000 ppm or 17 g/h • In case of type 2 leak detection and repair surveys: <ul style="list-style-type: none"> ○ 500 ppm or 1 g/h for aboveground components and for offshore components above the sea level ○ 1000 ppm or 5 g/h for the second step of underground components ○ 7000 ppm or 17 g/h for offshore components below the sea level and below the seabed 									
Repair of leaking components Art.14(4a)(4b)	Repair shall take place immediately, or no later than 5 days for first attempt and 30 days for a complete repair , unless specific criteria is met which permits additional delay by one year or until next shutdown (whichever is earliest)									
Resurveying of repaired components Art.14(5)	<ul style="list-style-type: none"> • Leaks above repair thresholds: no later than 45 days • Leaks below repair threshold: no later than 3 months (to ensure that leaks rate has not increased) 									
Recognition of good performance Art.14(2aa)	LDAR frequency reduced for non-leaking components if during 5 proceeding years <1% of total components and subcomponents in each site are leaking , and that methane emissions associated with these leaks aggregated represent <0.08% of the total volumes of gas or 0.015% of total mass of oil processed/extracted : <ul style="list-style-type: none"> • For all components at processing locations, Type 1 LDAR surveys at least every 12 months; • For at least 25% of all components at processing locations, Type 2 LDAR surveys are performed every 12 months, ensuring that all components are checked every 48 months; • For all components at production locations, Type 1 LDAR surveys at least every 36 months and Type 2 LDAR at least every 60 months 									

This overview from IOGP clearly summarizes the main aspects of art. 14 LDAR

- For underground pipeline >16bar, preventive pipeline integrity management is mandatory
- For underground pipeline <16bar, only LDAR Type 2 is needed

Article 14: LDAR – Best practices

If:

- Previous 5 years, based on MRV:
 - <1% sources leaking
 - <0.08% CH₄ emissions/gas volume

Then:

- Processing:
 - LDAR Type 1 – 1/year 100% scope
 - LDAR Type 2 - 1/year 25% scope
- Production:
 - LDAR Type 1 - every 3 years: 100% scope
 - LDAR Type 2 - every 5 years: 100% scope



Repair thresholds

Leak repair thresholds are as follows:

- In case of **Type 1** leak detection and repair surveys: **7000 ppm or 17 g/h**
- In case of **Type 2** leak detection and repair surveys:
 - **500 ppm or 1 g/h** for **aboveground** components and for offshore components **above sea level**;
 - **1000 ppm or 5 g/h** for the second step of **underground** components;
 - **7000 ppm or 17 g/h** for offshore components **below sea level and below the seabed**.



Repair of found leaks

Leaks above the threshold must be repaired immediately after detection but **not later than:**

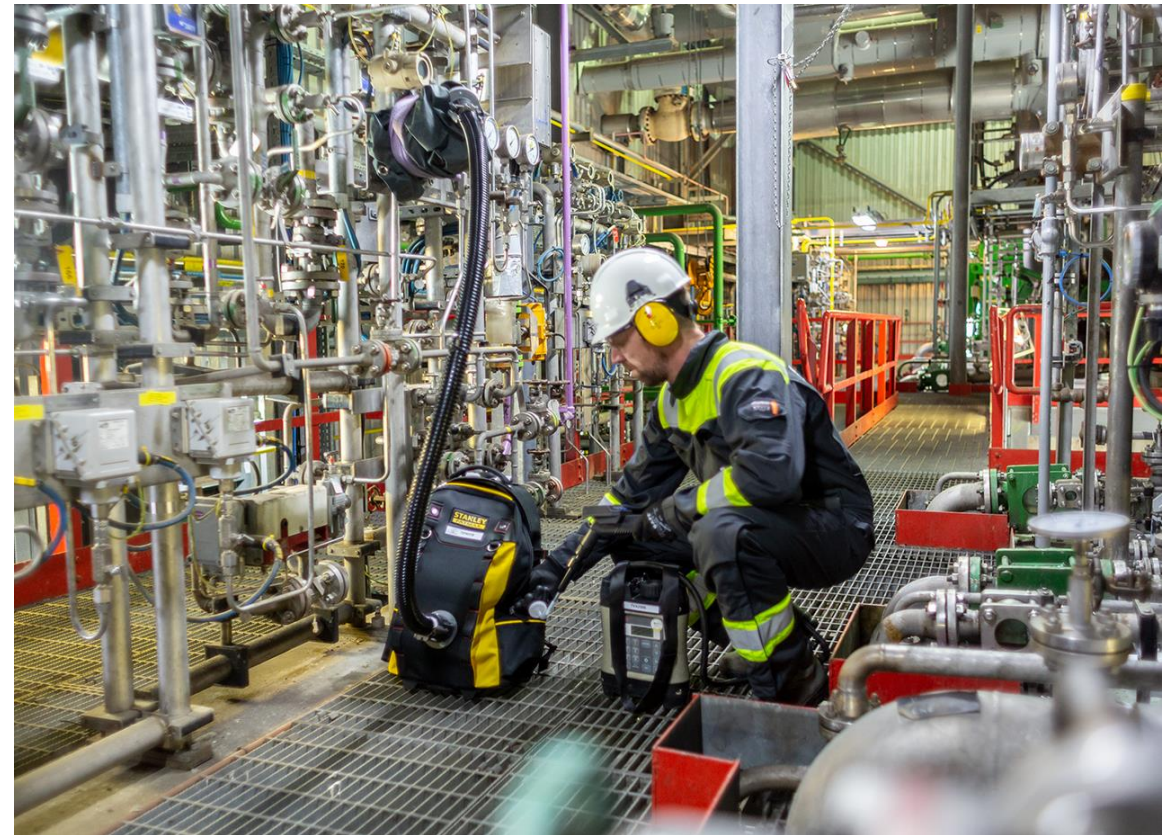
- **5 days for a first attempt.**
- If not repaired in the first 5 days, a schedule must be provided.
- **30 days for a complete repair.** If complete repair within 30 days is not possible you should minimize the leak. Large leaks always need to be prioritized.



Re-measurement

Components emitting

- **above the repair threshold** as soon as possible after the repair **and no later than 45 days.**
- **below the repair threshold** as soon as possible and **no later than 3 months.**



Article 14: LDAR for underground pipelines

The Regulation mentions a 2-step approach for underground pipelines:

1. At interface between ground and atmosphere to determine whether to dig (if above 1st leak threshold)
2. As close as possible to determine whether to repair (if above repair threshold)



Article 15-17 Venting and Flaring

Venting and routine flaring will be **prohibited from February 5, 2026, except in these cases:**

- Allowed for emergency and malfunctioning
- When deemed unavoidable. It should be reported
- When venting, you should explain why not flaring
- When flaring, you should demonstrate why other routes to re-use are not feasible

Reporting on Venting and Flaring (Annex III):

- Major event immediately
- Annual report of all events as part of MRV report

Flare and combustion devices with **DRE >99% from February 5, 2026**

- Regular frequent inspections or remote/automated monitoring systems (Annex IV)



Article 18 Wells

The Regulation focuses on:

- Inactive wells
- Plugged temporarily
- Plugged permanently
- Abandoned wells

Offshore oil and gas wells located at a water depth greater than 700 meters **may be exempted by competent authorities.**



Article 18 Wells - Deadlines

Submit reports (Annex V) with information on:

- quantification of methane emissions
- including pressure monitoring for inactive wells (and every 31 May)

*If emissions from wells are detected, then remediate.



* **Gradual approach for countries with large #** (20% by M12, 40% by M24 and 15% each year; complete by M72)

Articles 27-29 Importers

1

Before May 5, 2025 and every May 31st

Submit importer report, e.g.:

- list of exporter and producer (+countries)
- Whether presence of LDAR, measurement, quantification
- Verification

2

Before January 1, 2027

Imported oil and gas must meet EU standards (e.g., OGMP L5, independent verification) or equivalent

3

Before August 5, 2028 and after

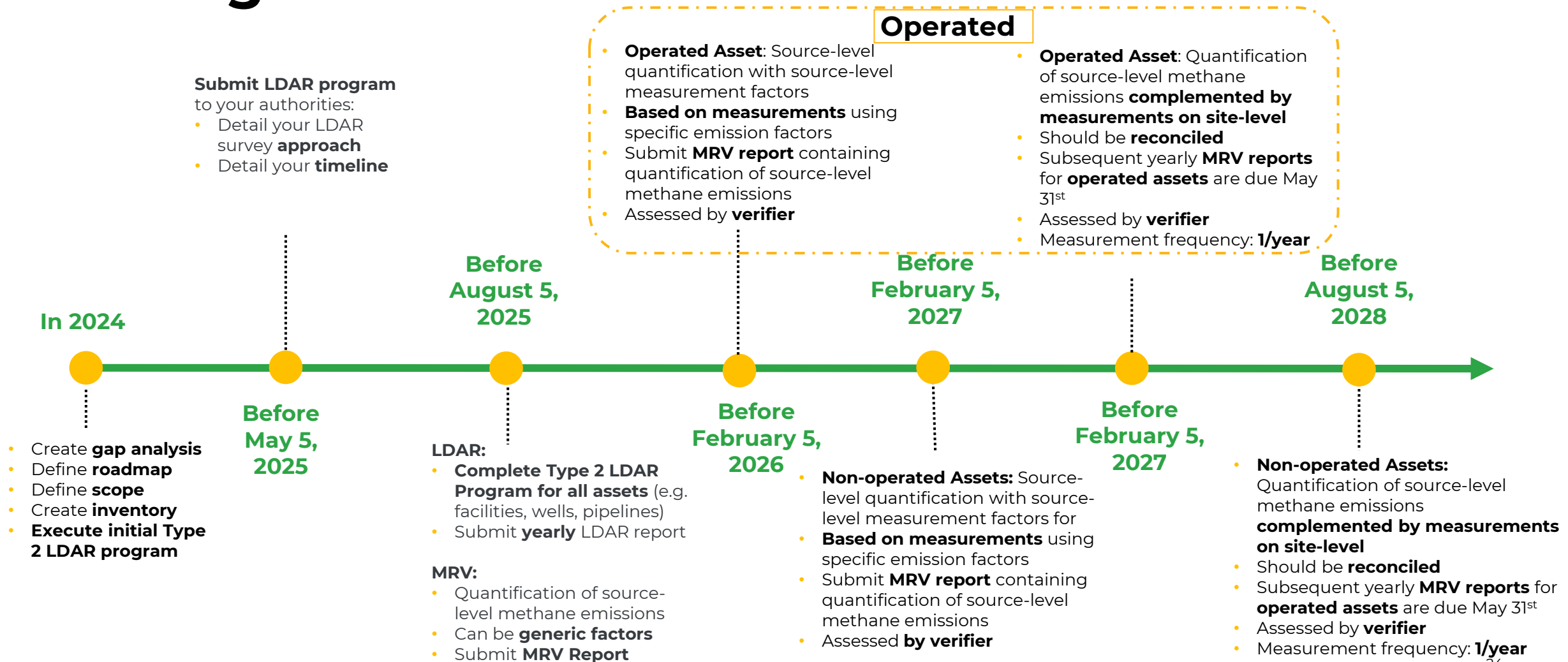
Yearly report of imported methane intensity (methodology in Delegated Act by 5 August 2027)

4

Before August 5, 2030

Methane intensity must be below limit (to be defined in Delegated Act)

EU Regulation Deadlines to hit



Open points

- Each **Member State** (MS) must **appoint** Competent **authorities** by **February 5, 2025**
- **Implementing Act by August 5, 2025:**
 - Minimum Detection Limits,
 - Techniques
 - Threshold 1st step underground
- **Independent Verifiers not yet accredited** by national accreditation bodies
- ...

Official Journal of the European Union EN
L series

2024/1787 15.7.2024

REGULATION (EU) 2024/1787 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 13 June 2024
on the reduction of methane emissions in the energy sector and amending Regulation (EU) 2019/942
(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 192(1) thereof,

Having regard to the proposal from the European Commission,

After transmission of the draft legislative act to the national parliaments,

Having regard to the opinion of the European Economic and Social Committee ⁽¹⁾,

Having regard to the opinion of the Committee of the Regions ⁽²⁾,

Acting in accordance with the ordinary legislative procedure ⁽³⁾,

Whereas:

(1) Methane is second only to carbon dioxide (CO₂) in its overall contribution to climate change and is responsible for approximately a third of current warming. The amount of methane in the atmosphere globally has risen sharply over the last decade.

(2) The Intergovernmental Panel on Climate Change (IPCC), created within the framework of the United Nations (UN), published in its Sixth Assessment Report the finding that deep reductions in anthropogenic methane emissions are needed by 2030 to limit global warming to 1,5 °C. That report shows that, although methane has a shorter average atmospheric residence time than CO₂, 10 to 12 years compared to hundreds of years, its greenhouse effect over a 20-year period is over 80 times more significant than that of CO₂. In particular, according to the IPCC, while methane has 29,8 times greater global warming potential than CO₂ on a 100-year timescale, it is 82,5 times more potent on a 20-year timescale.

(3) It appears from the Air quality in Europe – 2020 report of the European Environment Agency that methane is a precursor gas for ground-level ozone and contributes to air pollution. Tackling methane emissions would address not only environment and climate but also improve protection of human health.

(4) According to recent estimates by the UN Environment Programme (UNEP) and the Climate and Clean Air Coalition (CCAC), methane emission reductions of 45 % by 2030, based on available targeted measures and additional measures in line with the UN Sustainable Development Goals, could avoid 0,3 °C of global warming by 2045.

(5) According to the International Energy Agency online data service World Energy Balances, the Union is the world's largest importer of fossil energy, and as such, an important driver of global methane emissions.

(6) The European Green Deal combines a comprehensive set of mutually reinforcing measures and initiatives aimed at achieving climate neutrality in the Union at the latest by 2050. In its communication of 11 December 2019 on the European Green Deal, the Commission indicated that the decarbonisation of the gas sector would be facilitated,

⁽¹⁾ OJ C 323, 26.8.2022, p. 101.
⁽²⁾ OJ C 498, 30.12.2022, p. 83.
⁽³⁾ Position of the European Parliament of 10 April 2024 (not yet published in the Official Journal) and decision of the Council of 27 May 2024.

ELI: <http://data.europa.eu/eli/reg/2024/1787/oj> 1/61

The new Regulation brings challenges for operators

- **Ensuring** that this **complex new framework is clear** across all assets and stakeholders
- **Increased scope** and work
- Consistent **monitoring and data management** required **along the value chain** (including pipelines and wells)
- **Meeting strict deadlines** and complying in time
- **Quick** and effective **repair** (first attempt and full repair) with associated re-measurements
- **Communicate effectively** across different departments and with third parties



2. LDAR

Approaches

Challenges

Proposed solutions



Our Project Methodology for LDAR programs

1 Set up LDAR program & inventory

- Kickoff meeting
- Scope clarification - Data collection
- Source Inventory from P&IDs - LEC Nrs
- Stream Identification on P&ID's
- Setup software database

2 On site data collection

- Source Identification onsite
- Measurement of all sources
- Tagging of leaking sources – create tightening list
- Maintenance assistance
- Re-measurement

3 Data processing with SFEMP software

- Import measurement data
- Data validation and Calculation (Protocol, Legislation)
- Create maintenance orders
- Create report according ISO 17025 accreditation (EPA M21)

4 Reporting

- Deliver compliant reports ready for submission
- Software training for SFEMP upon request
- Define scope next year

Implementation of an LDAR program

LDAR input:

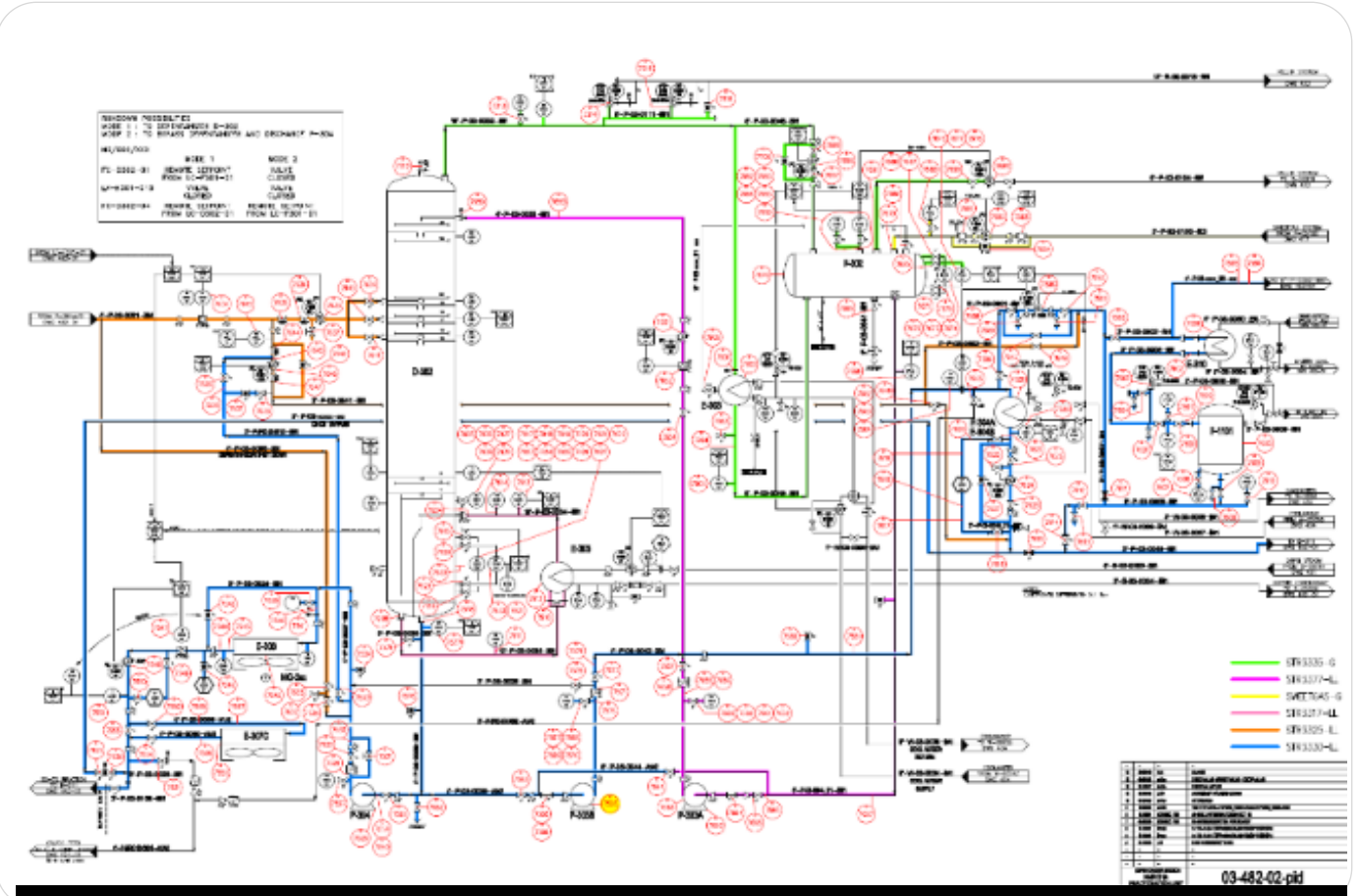


- P&IDs
- Flow Sheets
- Mass Balances / Composition info

Output:



- Source inventory
- Database, scope plan
- P&ID LDAR layer
- Response factors

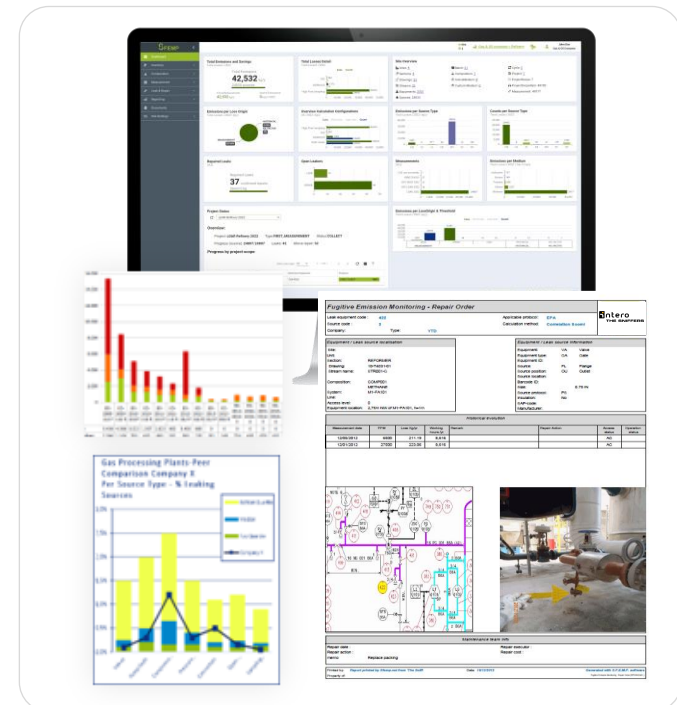
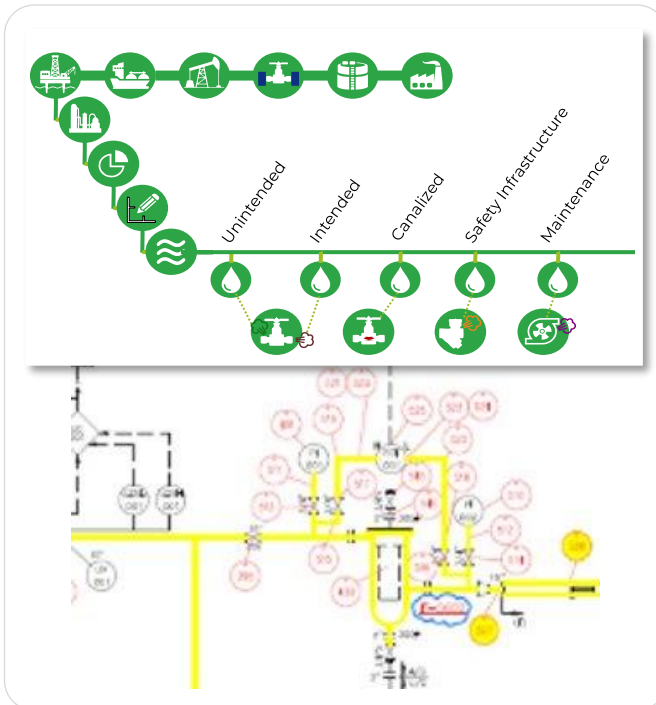


Implementation - L4 - LDAR programs

01 Identify
Detailed & high-quality inventory

02 Quantify
Fit for purpose measurements

03 Report & Improve
Emission reporting and benchmarking, Software



LDAR Type 1 and Type 2 explained



LDAR Type 1

Find larger leaks with lower accuracy through:

- OGI - qOGI
- Ultrasound camera
- RMLD (Laser technology)
- Continuous monitoring Fixed point sensor networks (Future ?)

LDAR Type 2

Find smaller leaks with higher accuracy through:

- FID/PID
- Infrared sensors
- High Flow Sampling



Leak visualization by Optical Gas Imaging



Leaking Flange
GF320 – Low Resolution

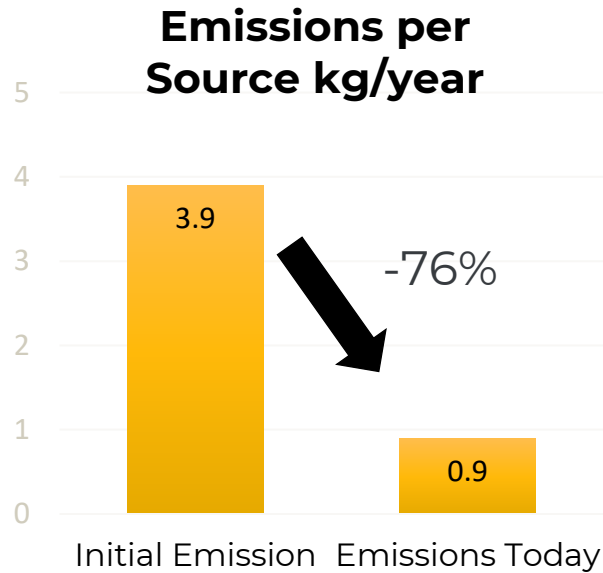


Leaking Cool bank Plugs
GF320 – Low Resolution

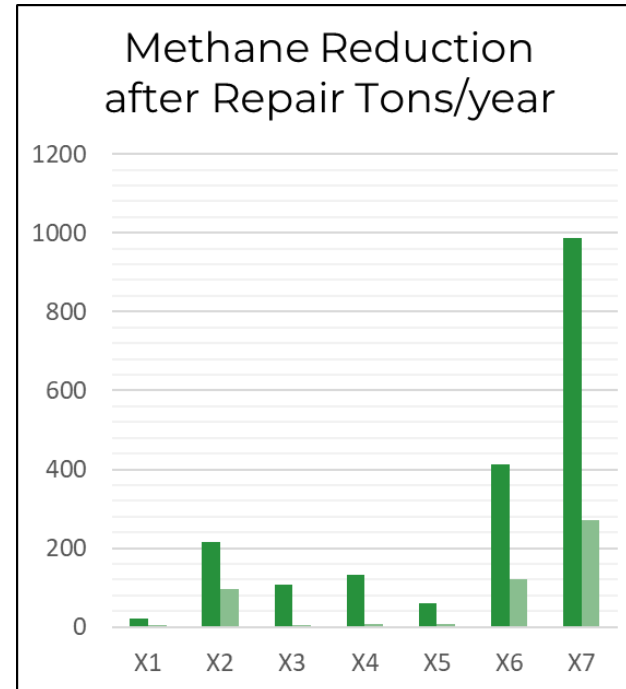


Leaking Sulfur Hexafluoride SF6
GF306 – Low Resolution

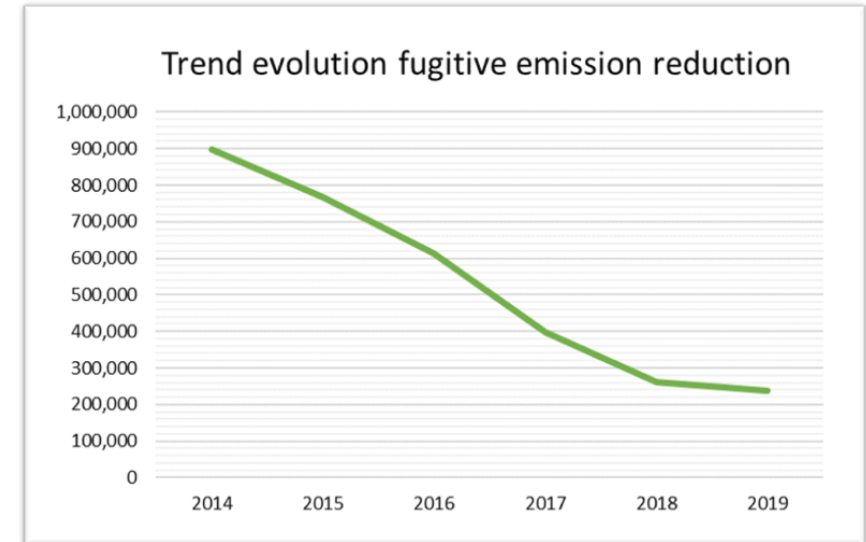
Typical results for LDAR on Fugitive Emissions



Intero – The Sniffers Study : 64 Companies
- 2Mio Sources – Evolution over 6 years
Fugitive



Intero – The Sniffers Study : 7 Gas Processing Plants
-70% in one year Methane

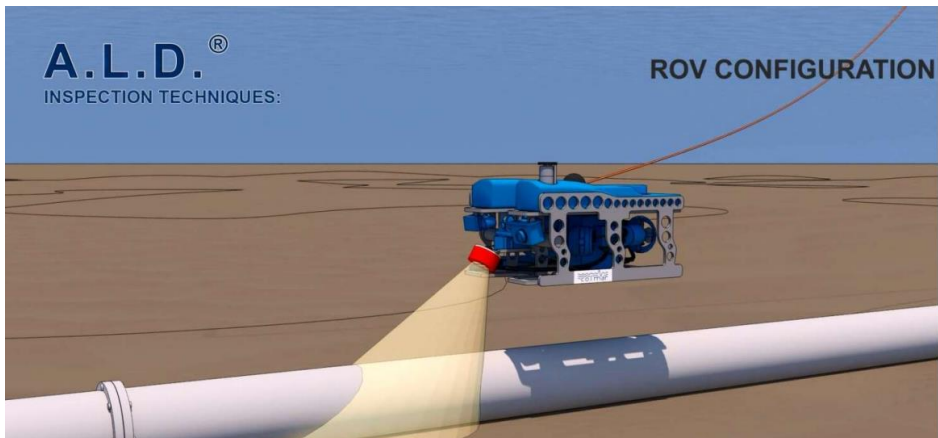
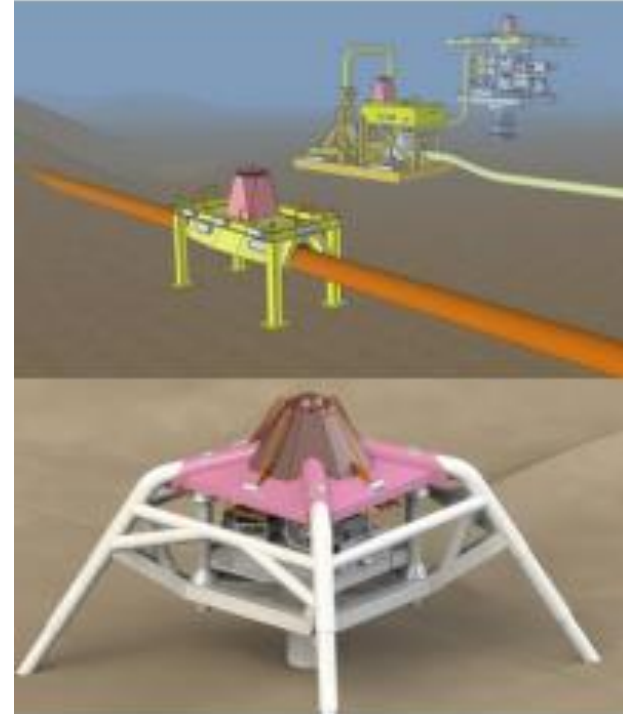


Intero – The Sniffers Study : Gas transport company
over 5 years (with a 25% Yearly scope)

Underwater inspections (LDAR and MRV)

Not so widespread but available for both

- Specific Assets (e.g., underwater **well**)
- **Pipeline**



Pipeline leak detection by car: project steps

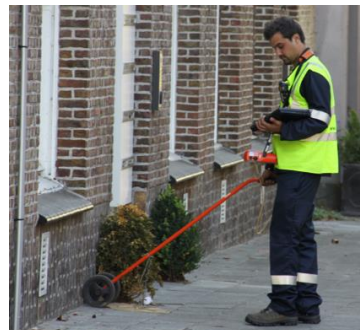
1

Data collection and detection of methane concentration above threshold by car, which triggers an alarm



2

Localization and verification of gas leak indication with handheld device



3

Emission quantification of underground leaks with High Flow Sampler



4

Registration of the gas leak and reporting in the desired format

It typically takes **1 hour** to complete all project steps once a gas leak indication has been found.

MRV

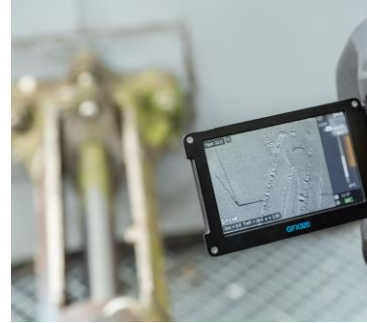
Approaches
Challenges
Solutions



OGMP/MRV: approved bottom-up and top-down measurement technologies



FID/PID/IR/Laser



Optical Gas Imaging



**High Flow Sampling
for quantification**



qOGI



**Acoustic
measurement**



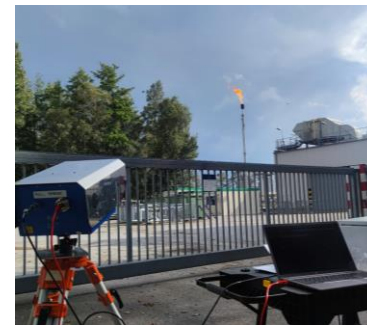
RMLD



**Gas leak detection on
buried pipelines by car
and on foot**



**TESTO 350
Combustion
monitoring**



**AGNI camera
Flare efficiency**



**Drone
measurements**

Benefits of Testo 350 for incomplete combustion

- Easy-to-use exhaust gas analyzer
- Methane-specific sensor with detection **limit up to 99,99%**
- **Usable** in difficult to reach areas
- **Test up to 6 gases simultaneously** – Select freely from sensors for CO, NO, NO₂, SO₂, H₂S, C_xH_y and CO₂
- **Mass flow** and **emission rates** with pitot tube



AGNI Camera – Flare efficiency monitoring

- Use of multispectral OGI camera called AGNI camera
- AGNI camera measures CH₄ and CO₂ in the flare's fumes
- Can be applied to all flares including:
 - Maintenance flares
 - Emergency flares
 - Mobile flaring installations both permanently and periodically

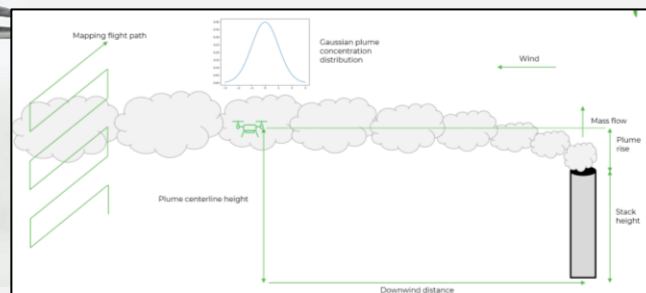


Site-level measurements for MRV/OGMP

Drones

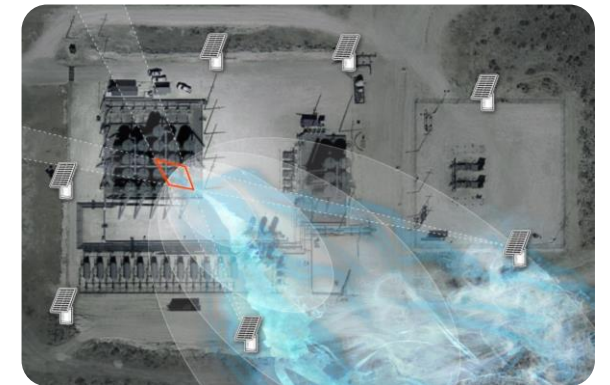
Fugitive emissions mapping & fence line monitoring methods are utilized for the mass flow analysis.

- TDLS –Laser spectroscopy
- Detection limit of 0.2 ppm
- Range 0.2 –40 000 ppm
- Highly selective



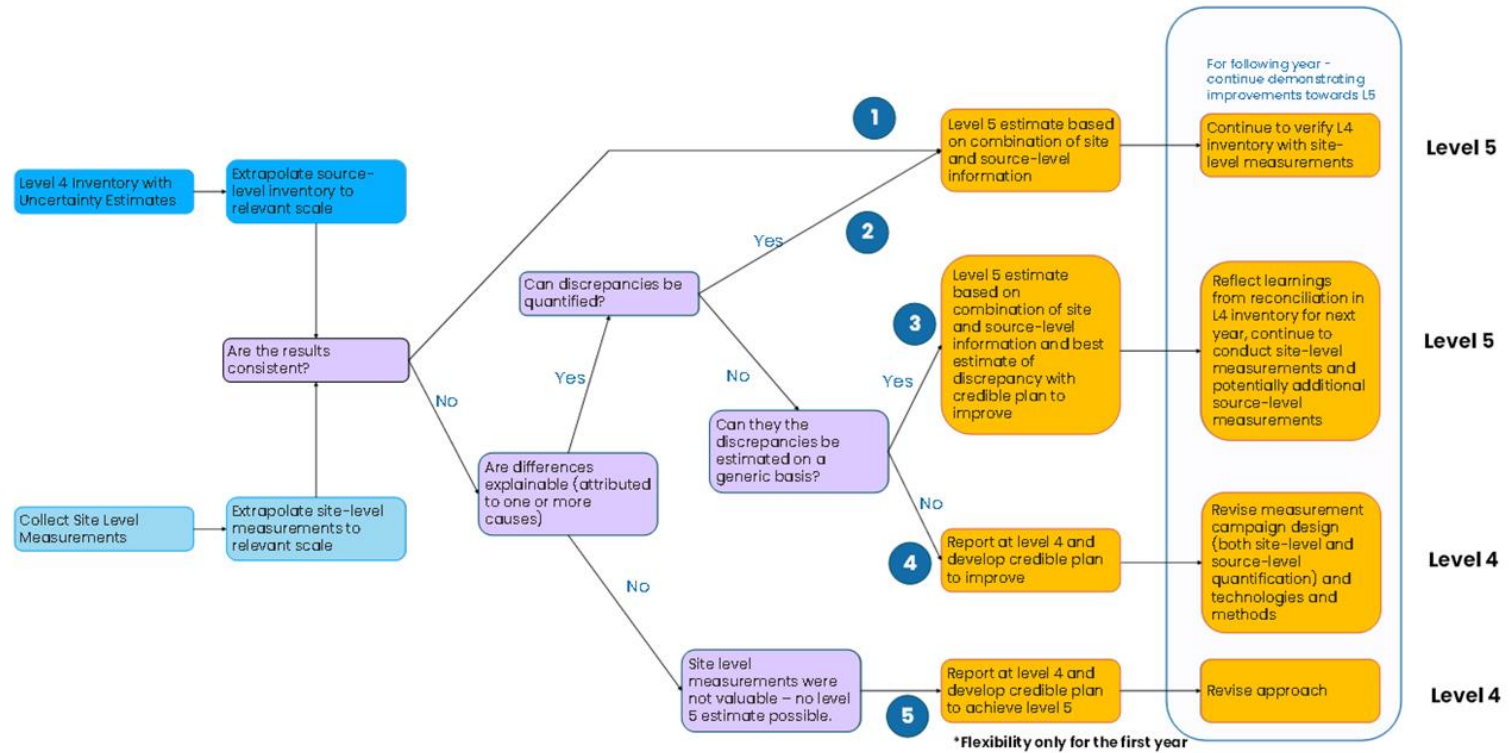
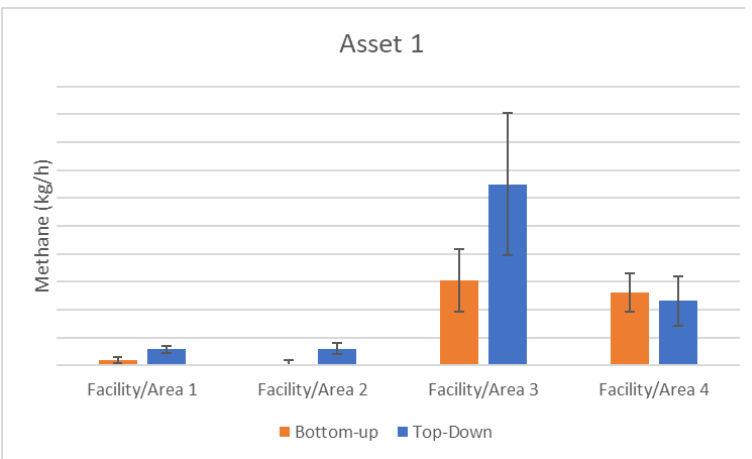
Sensor Network

- Continuous 24/7 measurement of emission
- Solar panel powering
- Localization accuracy ($\pm 5\text{m}$)
- 90 PoD 3.6 kg/h



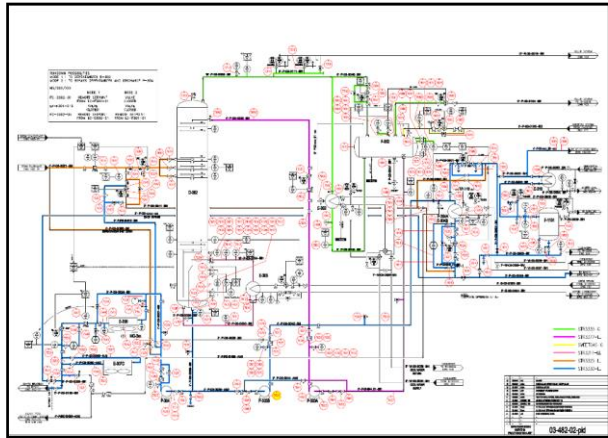
Reconciliation methodology for OGMP/MRV

COMMENT (optional)	Levels 1, 2, 3, 4			Level 5	
	Methane	Level	Comments	Methane	Comments
	kg/y	Please indicate the Level of the data 1, 2, 3, 4	Please feel free to provide additional information	kg/y	Please feel free to provide additional information
<small>Score for own data (green indicates score >= 75%) Measurements for uncertainty estimation Simulation Estimation</small>					
E	Transmission			8	
E1	Trial for transmission network				
E1.1	ISO - Pipeline Main line				
E1.1.1	Events				
E1.1.2	Pressure & venting (maintenance, process, combustion, pipe/communication)				
E1.1.3	Incident / Emergency events				
E1.1.4	Other				
E1.1.5	Decomplete combustion				
E1.1.6	Other				
E1.2	ISO - Reaction & regulating stations / Measurement stations / Meter stations / Consumer supply stations for industrial and residential				
E1.2.1	Positive emissions				
E1.2.2	Connections (flanges, seals, joints)				
E1.2.3	Valves and control valves				
E1.2.4	Pressure relief valves				
E1.2.5	BD/OEL (blow-down open ended line)				
E1.2.6	OTC				
E1.2.7	Others				
E1.3	Events				
E1.3.1	Pressure & venting (maintenance, process, combustion, pipe/communication)				
E1.3.2	Decomplete combustion				
E1.3.3	Pneumatic devices				
E1.3.4	Gas analyzer				
E1.3.5	Other				
E1.3.6	Incident / Emergency events				
E1.3.7	Other				
E1.4	Decomplete combustion				
E1.4.1	Gas combustion devices				
E1.4.2	Heat/pore heating system/bolers, gas delivery unit				
E1.4.3	Other				

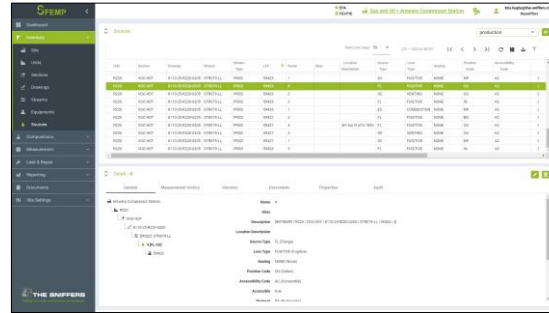


*Flexibility only for the first year

Emission management software SFEMP brings it all together



P&ID



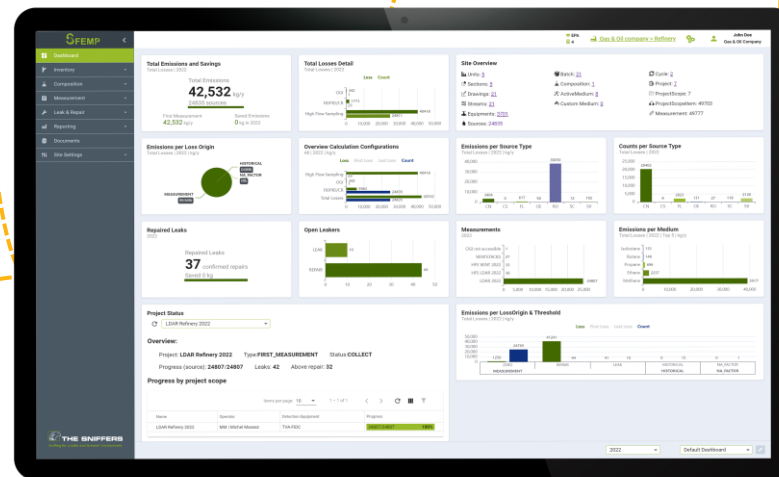
Inventory

		L3				L4				
		AVERAGE_FACTOR	OGI	FID	HFS	QOGI	FLOW_METER	EXHAUST_GAS_ANALYSIS	MULTISPECTRAL_RADIOMETRIC_IMAGING	REVERSE_DISPERSION_MODELING
COMBUSTION	FLUENT									
	VERTICAL									
STATIONARY	COMBUSTION									
	FLARE									

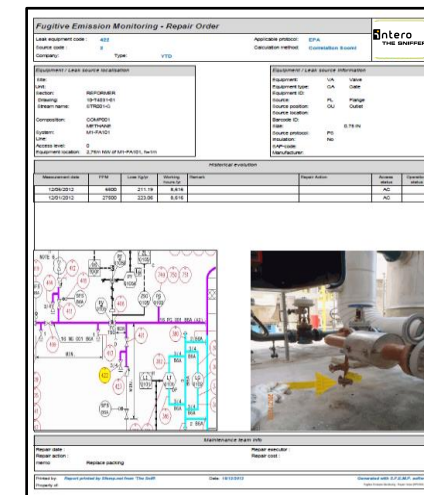
Correlation & emission factors

Level 1 (Summary)	Location	Level	Comments	Status	Comments
Transmission network	101	Level 1, 2, 3, 4	Please refer to Level 2 file to provide additional information	101	Please refer to Level 2 file to provide additional information
Total for Transmission network					
Level 1					
Level 2					
Level 3					
Level 4					
Level 5					

Reporting template (e.g., EU/OGMP)



SFEMP



Repair order / maintenance follow-up

Thank you.

Questions?

Federico Noris

Innovation Lead & Project Manager

M +32 475 52 00 71

E Federico.noris@intero-integrity.com