



GERG: The European Gas Research Group

Joining Forces for a Sustainable Energy Future



GERG

THE EUROPEAN GAS
RESEARCH GROUP



The European Gas Research Group



Our members



Associate members



- Collaborative R&D group for gas with strong industry focus
- Over 30 members - gas companies, research centres and universities
- Young Researchers Event – Awards supporting the best students
- Links to Brussels Institutions and External Organisations



EC-funded Projects

DEO • CONRAD • DIGBUILD • VOGUE • MICROMAP • PRESENSE • LABNET • GIGA • COMBO • NATURALHY • ORFEUS • INTEG-RISK • GASQUAL • LNG DENSITOMETER • ELEGANCY • THYGA • Biomethane Barriers (BioStar2C) • H2PNR • Met4H2 • MetCCUS • BiometCAP • OPTHYCS • THOTH2 • MetHyTrucks • SHIMMER • CANDHy • PilgrHYm • NHyRA • COREu • H2FlowTrace • MaritimeMET • SmartGasNet • CryoMet • MetNH3Energy • HyQualNet • Metronome

Addressing research priorities: GERG Working Groups



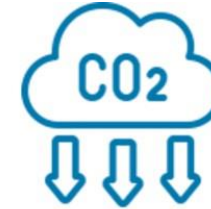
Emissions



Biomethane



Hydrogen



CCUS

Brainstorming phase

Gathering of insights from GERG industry professionals and experts.

Definition of research topics

Scoping of research knowledge gaps and evaluation of criticality.

Production of the roadmap

Summary of results and recommendations for the most prominent research topics.

Project creation in the GERG WGs:

- * Biomethane
- * CCUS
- * Methane Emissions *
- Hydrogen
- * Others (e.g. LNG)

- Collaborative process
- Information exchange
- Launching research projects
- Yearly prioritisation review
- Cross-cutting subjects (e.g. e-methane, e-fuels)
- Pre-normative research (PNR), industry needs



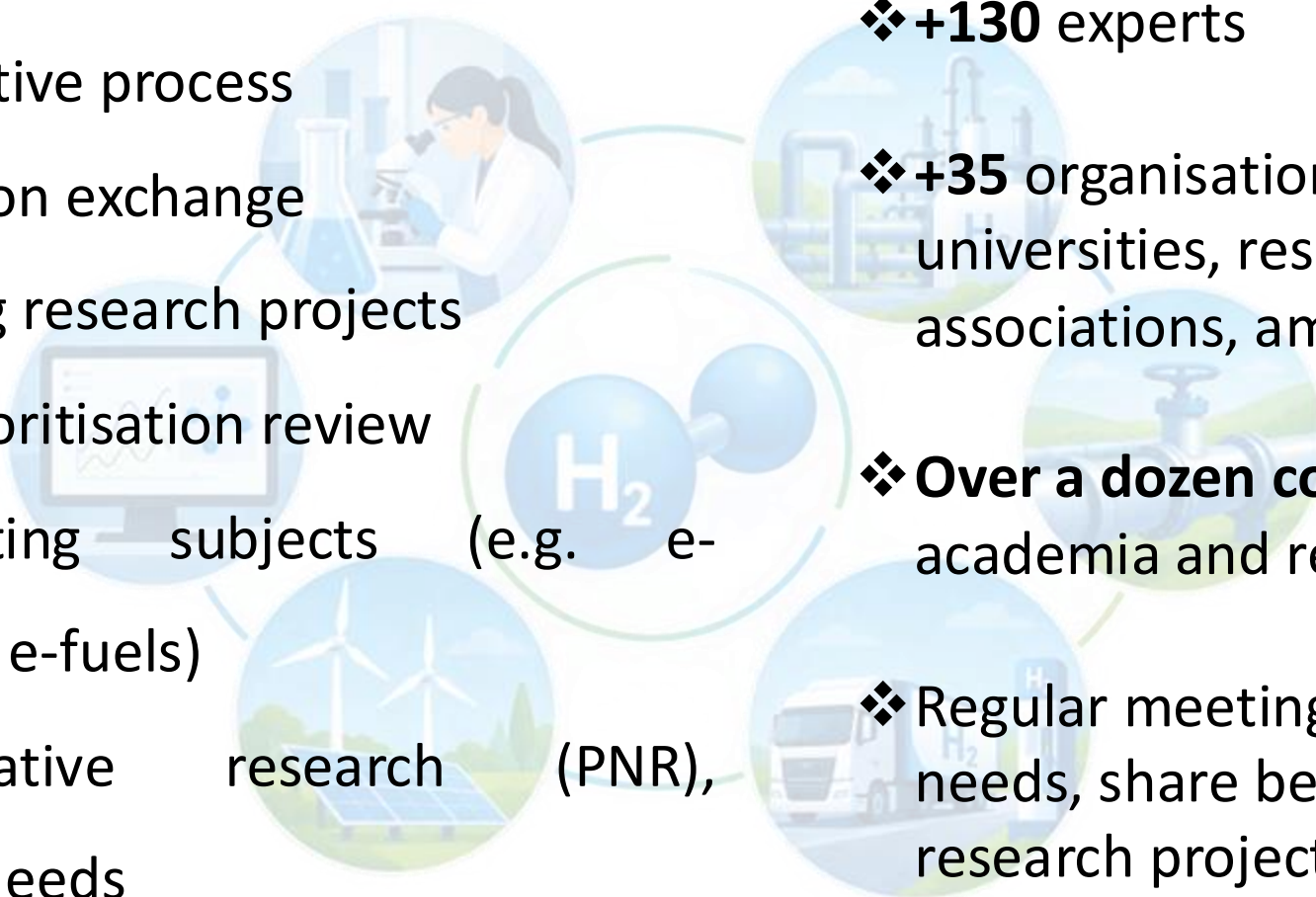
NATURALHY Project: : *“Preparing for the hydrogen economy by using the existing natural gas system as a catalyst”*

1 May 2004 – 31 October 2009

GERG, pioneer in the hydrogen economy.

It was in **2002** when this project started to be shaped by GERG with the intention of examining the barriers that existed to, and the advantages that would accrue from the addition of H₂ to the natural gas transmission and distribution system.

The GERG Hydrogen Working Group

- 
- Collaborative process
 - Information exchange
 - Launching research projects
 - Yearly prioritisation review
 - Cross-cutting subjects (e.g. e-methane, e-fuels)
 - Pre-normative research (PNR), industry needs
- ❖ **+130** experts
 - ❖ **+35** organisations (TSOs, DSOs, SSOs, universities, research centres, European associations, among others)
 - ❖ **Over a dozen countries** from industry, academia and research
 - ❖ Regular meetings to discuss research needs, share best practices, create research projects and present hydrogen project outcomes

Closing the Knowledge Gaps for Hydrogen Infrastructure Deployment



- Europe cannot deploy hydrogen infrastructure at scale unless critical technical and operational uncertainties are addressed.
- The GERG Hydrogen Research Roadmap identifies and prioritises the research needed to accelerate safe, reliable and economically viable hydrogen infrastructure deployment across Europe.
- Supply chain focused.

The GERG H2 Research Roadmap

An industry led gap analysis
of priority research needs
to enable hydrogen integration

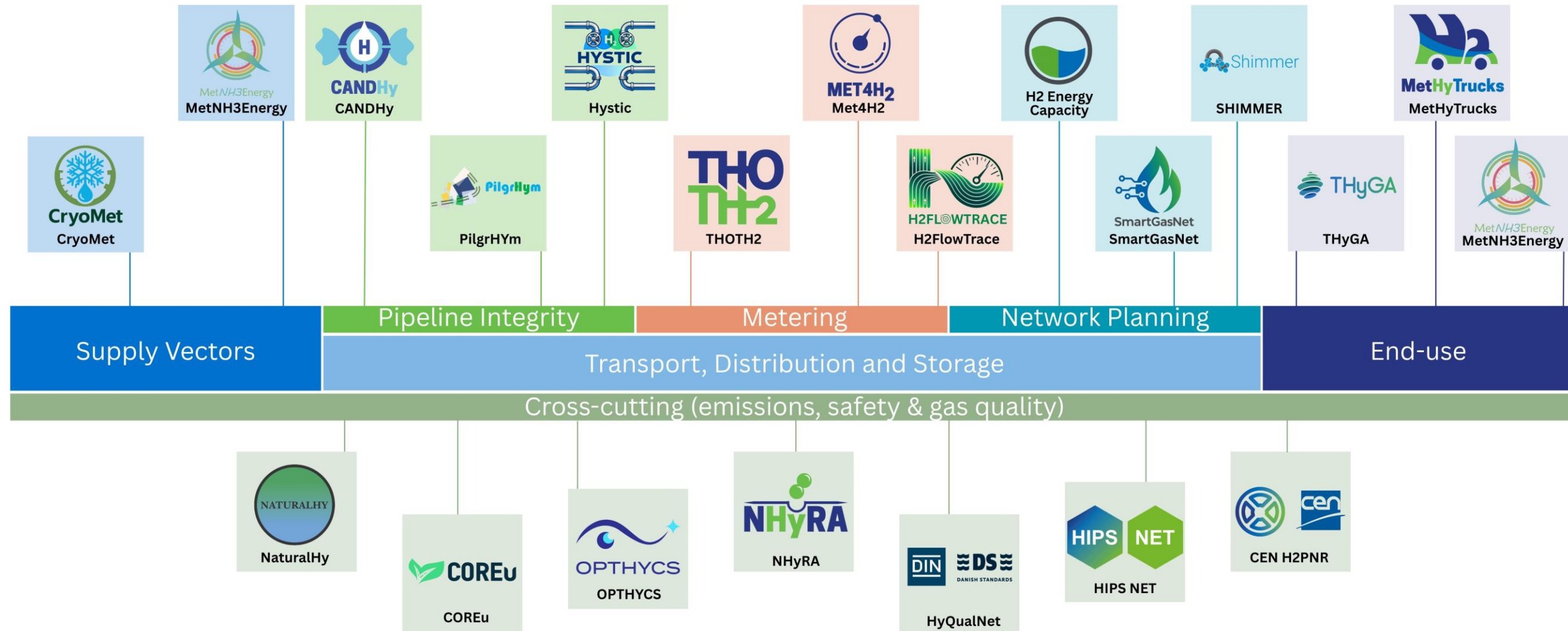
5
sections

26
categories

172
research
topics



Mapping of existing GERG collaborations to the roadmap



Overview of recent hydrogen projects

	project	full name	status	resources
Emissions	OPHYCS	Optic Fibre-based hydrogen leak control systems	finished	Website
	NHyRA	pre-Normative Research on Hydrogen Releases Assessment	ongoing	Website
Cross-cutting	Met4H2	Metrology for the hydrogen supply chain	finished	Website
Metrology & metering	THOTH2	Novel methods of testing for measurement of natural gas and hydrogen mixtures	ongoing	Website
	H2FlowTrace	Flow measurement traceability for hydrogen in gas networks	ongoing	Website
	CryoMet	Metrology for reliable liquefied energy gases measurement	ongoing	Website
	MetNH3Energy	Metrology to Support Ammonia Use in Emerging Applications	ongoing	Website
	SmartGasNet	Metrology for smart metering in gas networks	ongoing	Website
Network planning	MaritimeMET	Metrology for green maritime shipping	ongoing	Website

project	full name	status	resources	
MetHyTrucks	Metrology for hydrogen fuel sampling for heavy duty transport	finished	Website	End use
THyGA	Testing Hydrogen Admixture for Gas Applications	finished	Website	
SHIMMER	Safe Hydrogen Injection Modelling and Management for European gas network Resilience	finished	Website	Safety & integrity, network planning
CANDHy	Compatibility Assessment of Non-steel metallic distribution gas grid materials with Hydrogen	ongoing	Website	
PilgrHym	Pre-normative Research On Integrity Assessment Protocols Of Gas Pipes Repurposed To Hydrogen And Mitigation Guidelines	ongoing	Website	
HYSTIC	Hydrogen in service tightness criteria (testing flanges, valves and fittings)	ongoing	Website	
Energy Capacity for H2 in NG networks	Determining Energy Capacity for Hydrogen In Existing Natural Gas Pipelines	finished	Website	
CEN H2 PNR	Removing the technical barriers to use of hydrogen in natural gas networks and for (natural) gas end users.	finished	Website	Cross-cutting
EISMEA HyQual Net	Hydrogen quality in dedicated gaseous hydrogen networks	finished	Website	

Thank you for your attention!

secretariat@gerg.eu



HYSTIC: GERG joint industry project



“Determination of in-service tightness criteria to qualify components and installations (for hydrogen)”

WP1: Long and short-term seals ageing (flange gaskets performance)

WP2: Valve sealing characterization

WP3: Fittings characterization

 Specimen definition

 Test protocols

The project aims at assessing the sealing performances in operating conditions of several material / equipment used in H₂ applications.

Interested to participate? [Contact us](#)

Scope both 100%H₂ & H₂NG blends



NHyRA project

pre-Normative Research on Hydrogen Releases Assessment



NHyRA project general info

n° partners	14 (from 8 countries)
Duration	36 months
Project budget	3,5 M€
Type of action	Research and Innovation Action
Start/end date	Jan 2024 – Dec 2026 (extension until June 2027)



Project coordinator



WPs and activities

WP1: H2 release inventory

WP2: Methodology development for H2 releases quantification

WP3: Methodology validation and field tests assessment

WP4: H2 releases from supply chains

WP5: H2 release scenarios

WP6: Dissemination, Communication & Exploitation

WP7: Coordination and Project Management



Project context



- H_2 as an energy vector could play a crucial role in meeting the Green Deal target of climate neutrality by **2050**.
- **H_2 molecule** can react with hydroxyl radicals present in the atmosphere, extending methane's lifetime thus acting as an **indirect greenhouse gas**.
- To date, there is still **uncertainty regarding the amount of the H_2 emissions** expected along the future H_2 value chain, the associated environmental impact and the size of the future H_2 market.
- A **dedicated normative framework**, including testing methodologies for hydrogen emissions, **does not exist**: the CH_4 emissions regulating scheme could be a methodological reference.

Project objectives

The aim of the NHyRA project is the **assessment of potential H₂ emissions along the entire H₂ value chain**. Being the knowledge about the amount of anthropogenic H₂ in the atmosphere very scarce in literature, the improvement of the capability to quantify small and large releases, **delivering validated methodologies and techniques** for measuring or calculating them, is of outstanding importance.

1. Creation of a hydrogen emissions inventory for the anthropogenic H₂ emission from the hydrogen value chains

2. Development and validation of methodologies for detecting and quantifying the H₂ emissions

3. H₂ emissions quantification and definition **scenarios** considering different time horizons (e.g. 2030, 2050)

4. Provide recommendations to International Standard Bodies and mitigation strategies for reducing the H₂ emissions identified

Preliminary findings

Peer-reviewed scientific paper: *Methods for detecting and quantifying hydrogen emissions over a wide range of temporal and spatial scales: a state-of-the-art review* ([link](#))

Preliminary reports available on project website ([Publications Archives – NHyRA](#))

- D1.1 G2 supply chains' unit processes
- D1.2 First version of the H2 releases' database
- D1.3 First version of the priority list of archetypes
- D2.1 Report containing a list of techniques for detecting and measuring H2 emissions
- D2.2 – Set of standard and improved procedures for detecting and quantifying H2 emissions
- D2.5 – Calculation based methods to quantify releases not covered by the experiments



OPTHYCS

OPTIC FIBRE-BASED HYDROGEN LEAK CONTROL SYSTEMS



- Project timeline
- 2023-2025

The project is supported by the Clean Hydrogen Partnership and its members Hydrogen Europe and Hydrogen Europe Research.



Funded by
the European Union

Introduction

Developing a continuous monitoring system based on optic fiber for H₂ leaks detection

Contributing to a safe and economically viable implementation of H₂ throughout its value chain

The **growing production and use of H₂** **increase risks of leaks** during storage, transport, and distribution.

Hydrogen leaks pose **safety risks** due to its broad flammability range and contribute to climate change as H₂ has an indirect GWP (recent studies indicate a **100-year GWP of H₂ from 11.6 ± 2.8 to 12.8 ± 5.2**)



The aim is the **development of Proof of Concept (POC) for a detection system** that combines the benefits of different detection technologies

It has been **validated at realistic use cases scenarios**, aiming to achieve TRL 6, being the basis for further R&D and potential market entrance in the longer term

PROJECT PARTNERS



Key technology developments

The project includes the development of a *new interrogator system* able to 'read' FBG sensor measurements. This includes several key initiatives:

FBG new Interrogator System

- **Erbium-Doped Fiber Amplifier (EDFA)**

LUMIKER is adapting its EDFA to enhance optic signals in fiber optic systems, with a prototype under development for testing and integration.

- **Semiconductor Optical Amplifiers (SOA)**

LUMIKER is experimenting with the implementation of SOA to increase optical power. This advancement could allow the reading of a larger number of sensors to reach the goal of reading 100 sensors at 1Khz with a single interrogator.

- **H₂ Leak Signal processor**

Different lasers are being investigated for cost-effectiveness, and a PCB-FPGA circuit with signal filters and new firmware is being developed to improve communication between electronic components.

- **Interrogator solutions to improve the sensitivity of the new H₂ Sensors**

Improvement of H₂ Sensors: Various methods of connecting the fiber output from the interrogator are being tested, considering the influence of fiber orientation and operating temperature on the stability of light pulses.



Key technology developments

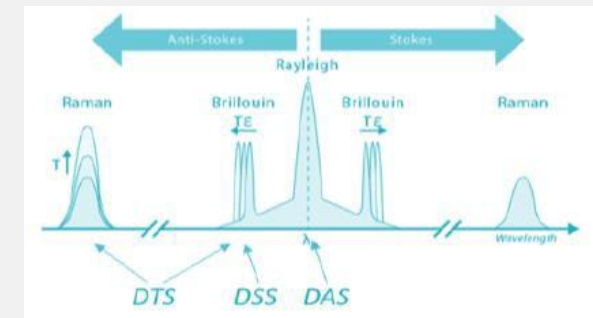
Combination of distributed sensing (DAS) & specific localized sensing (FBG) will be developed

DAS: Distributed Acoustic Sensing

DAS **principle of operation** relies on the Rayleigh backscattering of a light pulse propagating through the fiber. When travelling into the fiber, a tiny fraction of the pulse is continuously sent back to the DAS interrogator by random heterogeneities inside the core fiber.

A **local acoustic stimulation** on the fiber will modify the way the light is propagating allowing its detection and its location using the flying time of the light. As the pulse travels very fast, the entire fiber can be interrogated several times by sending series of pulses allowing to resolve the acoustics in the time/frequential domain.

The **acoustic bandwidth** can extend from **less than the Hz to several tens of kHz**. Basically, all interrogators will be single ended systems, i.e., they need to have access to only one end of the fiber.



- **DTS: Distributed Temperature Sensing**
- **DSS: Distributed Strain Sensing**
- **DAS: Distributed Acoustic Sensing**

Combination of technologies

To combine both **DAS and FBG sensors**, a **characterization of the acoustic maps of different leak types** (% of H₂ Content in a gas, Leak Pressure and Flow Rate, location of the leakage(s), Crack Form and Material) **will be performed**. The objective is to be able to distinguish these events even when they interfere with external noise.

Key technology developments

Integrated Software Solution Development

Data Processing

Server part: data collection and processing/decision through advanced algorithms. The DAS is a very sensitive sensing instrument, able to resolve a wide frequency range spectrum. The use of DAS and FBG sensors allow to optimize the reliability of the results obtained with the DAS.

To take advantage of the potential information carried by DAS measurements, a **Machine Learning algorithm** is going to be applied. These algorithms are already employed for leak detection in infrastructures such as pipelines. A set of **57 features are computed. All of them are related to waveform, spectral or pseudo-spectral information and will combine the use of FBG signals to estimate ppm levels.**

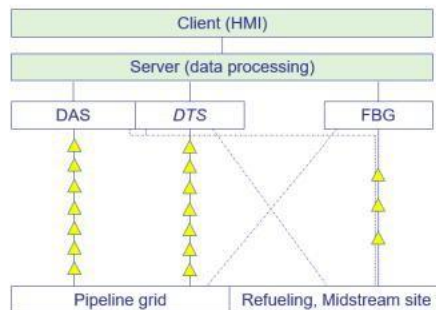
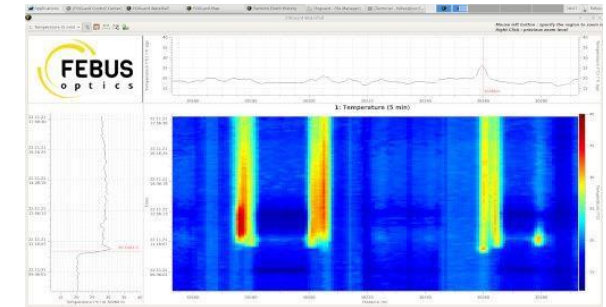
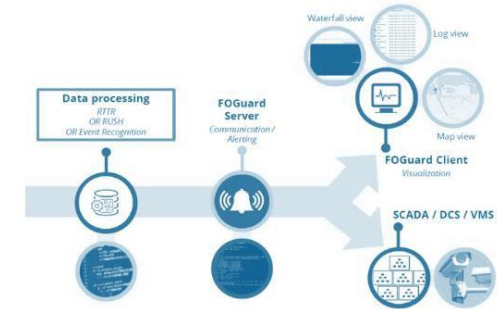
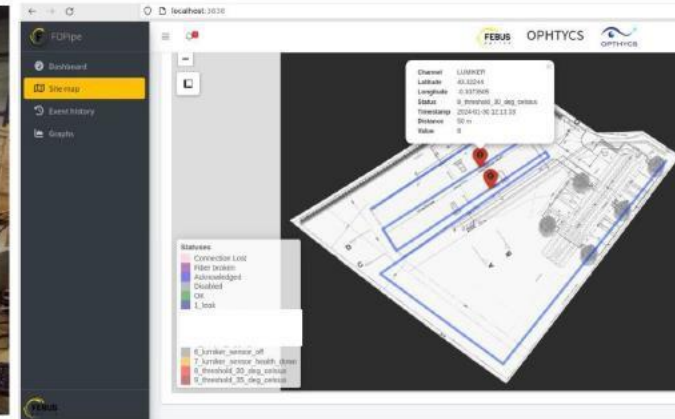


Figure 2: Simplified architecture overview

Architecture



Project results

Some publications available on the project website:

[Publications Archives – OPTHYCS](#)

- [D1.1 Technical requirements and Design Basis](#)
- [D1.2 Regulatory framework definition](#)