

# GREEN PIPELINE PROJECT

The Natural Energy of Hydrogen.

INSTITUTIONAL PARTNERS

**FUNDO  
AMBIENTAL**

**seixal**  
câmara municipal

TECHNICAL PARTNERS

**G** Gestene

**PRF**  
Gas Solutions

**ISQ**

**TÉCNICO  
LISBOA**

**BOSCH**

**catim**

**AP2H<sub>2</sub>**  
Associação Portuguesa  
para a Promocão  
da Hidrogénio



# Floene Overview

Floene is the largest gas distributor in Portugal with approx. 72% market share<sup>(1)</sup>

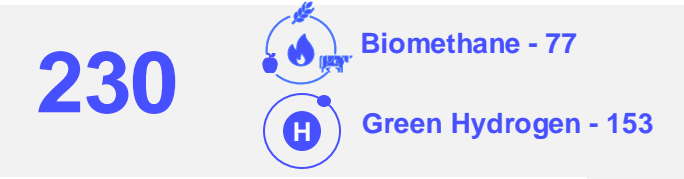
## Overview

- Floene is the **leading gas distributor in Portugal**:
  - Manages **nine Regional Gas Distribution Operators (“DSO”)**, which account for **c. 72%<sup>(1)</sup> of the gas distribution network** under the public service regime.
  - Operates **one of the most modern and efficient gas infrastructures in Europe**, mostly made up of polyethylene pipelines (94%), with an average age of c. 16 years.

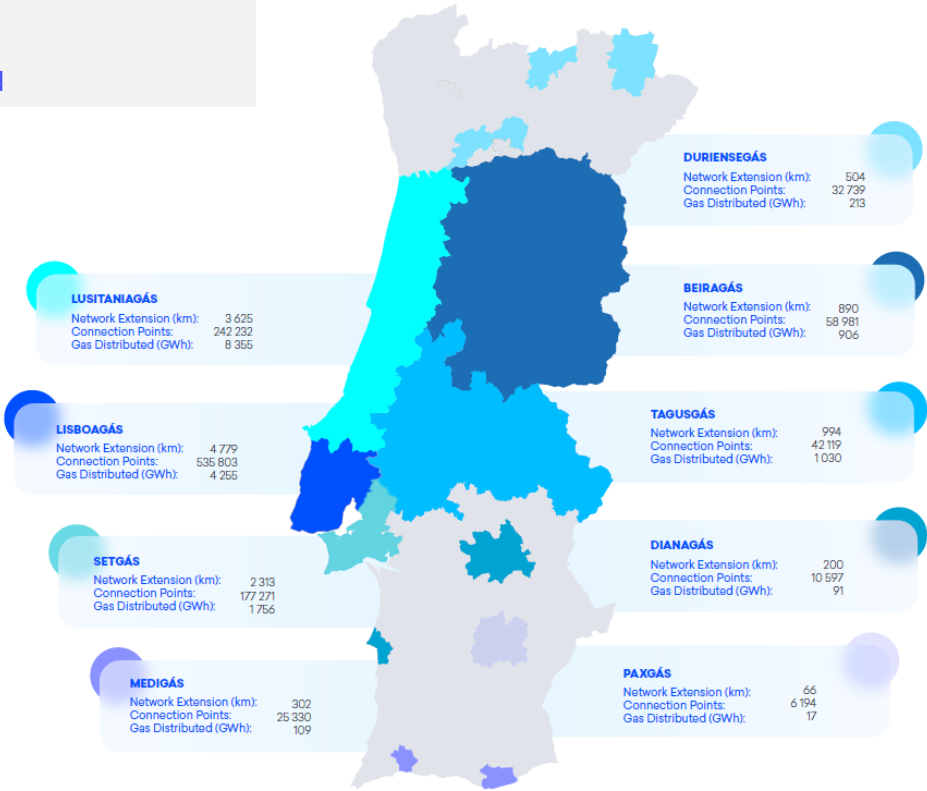
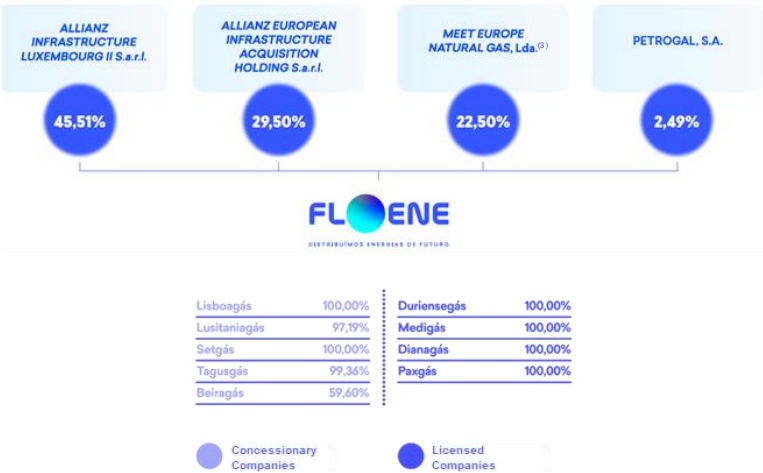
## Selected Technical Indicators<sup>(2)</sup>

- 1,131k** connection points
- 106** municipalities
- 13,673 km** network length
- 16,733 GWh** of gas distributed

## Renewables injection information requests




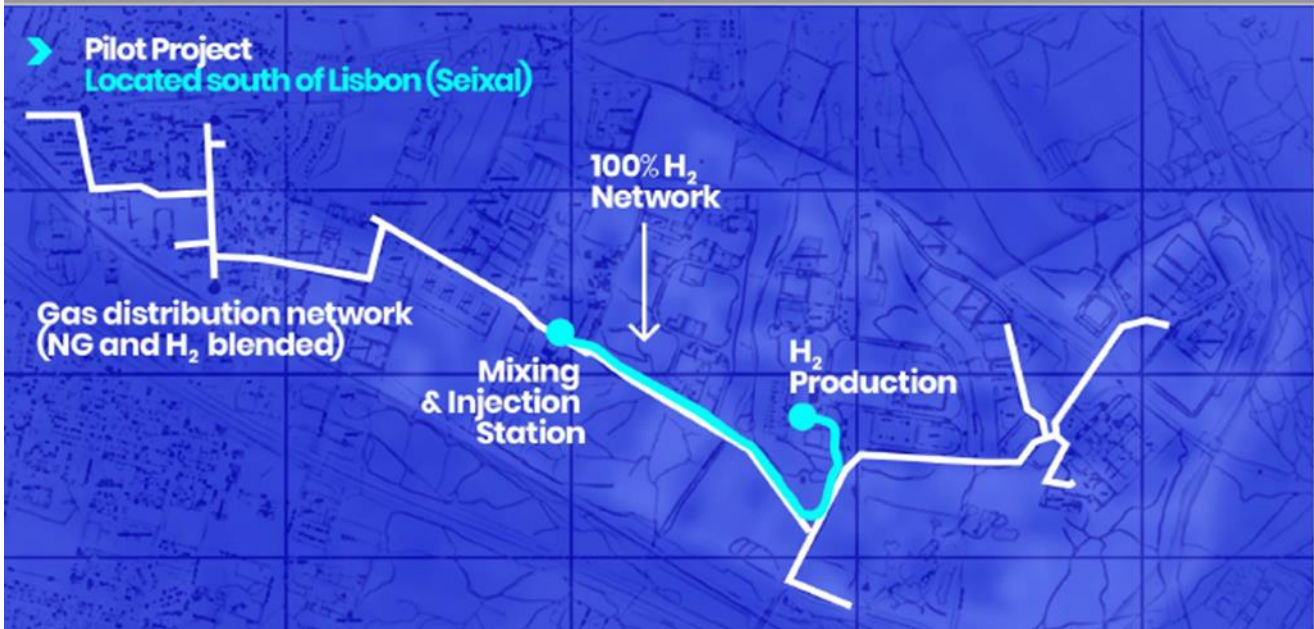
## Shareholder structure



Notes: (1) In terms of connection points. (2) Per Annual Report 2022, as of 31 December 2022. (3) Meet Europe Natural Gas, Lda. (consortium formed by the Japanese companies Marubeni Corporation and Toho Gas Co.Ltd.)

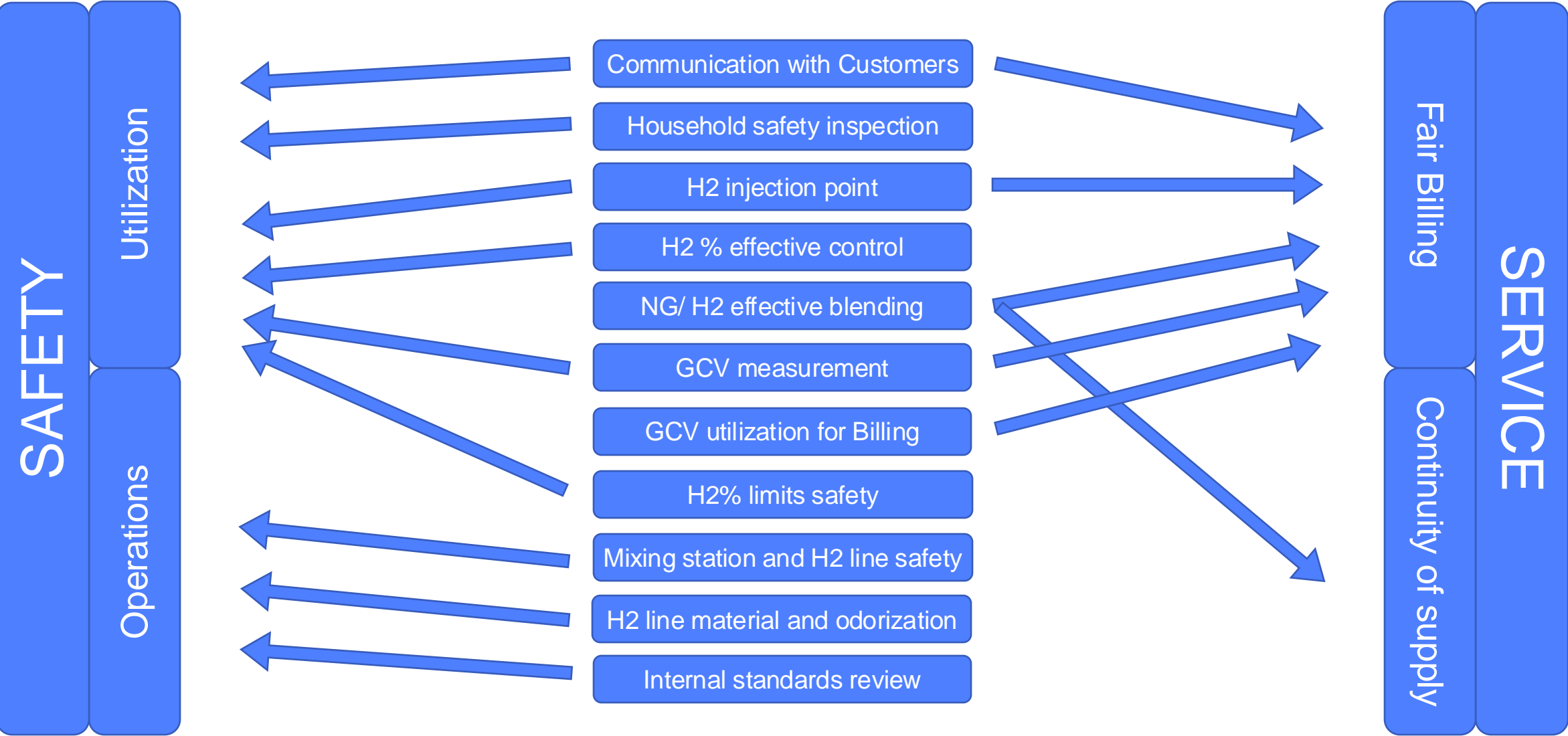
# 2 GPP - Small scale Green Hydrogen injection into the gas grid

H <sub>2</sub> Producer	
Customers	~ 80 Mainly Residential
Project duration (years)	2
H <sub>2</sub> to be injected (Nm <sup>3</sup> /2 years)	131,400 (45% from solar cells; 55% from the grid)



- Hydrogen is produced by GESTENE, using a 57 kW Mc Phy electrolyser, capable of producing 10 Nm<sup>3</sup>/h of 99.999% pure H<sub>2</sub> at 10 bar.
- Power supplied by solar panels and public grid.
- Solar panels capacity: 25 kW
- A suitable H<sub>2</sub> injection point was identified, downstream to a Pressure Reduction Station (PRS 50) where a H<sub>2</sub>/NG Mixing Station was installed
- A 4 bar, 100% H<sub>2</sub>, PE connection line was built between GESTENE premises and the Mixing Station.
- A small area of the natural gas grid, supplied by the PRS 50, with about 80 customers, was isolated from neighbouring grid, becoming the object of the Project.
- H<sub>2</sub> blending up to 20% in 2% increments (currently 12%)
- Injection started in July 2022
- Project fully funded by the Environmental Fund

# 3 Project Concerns and Solutions



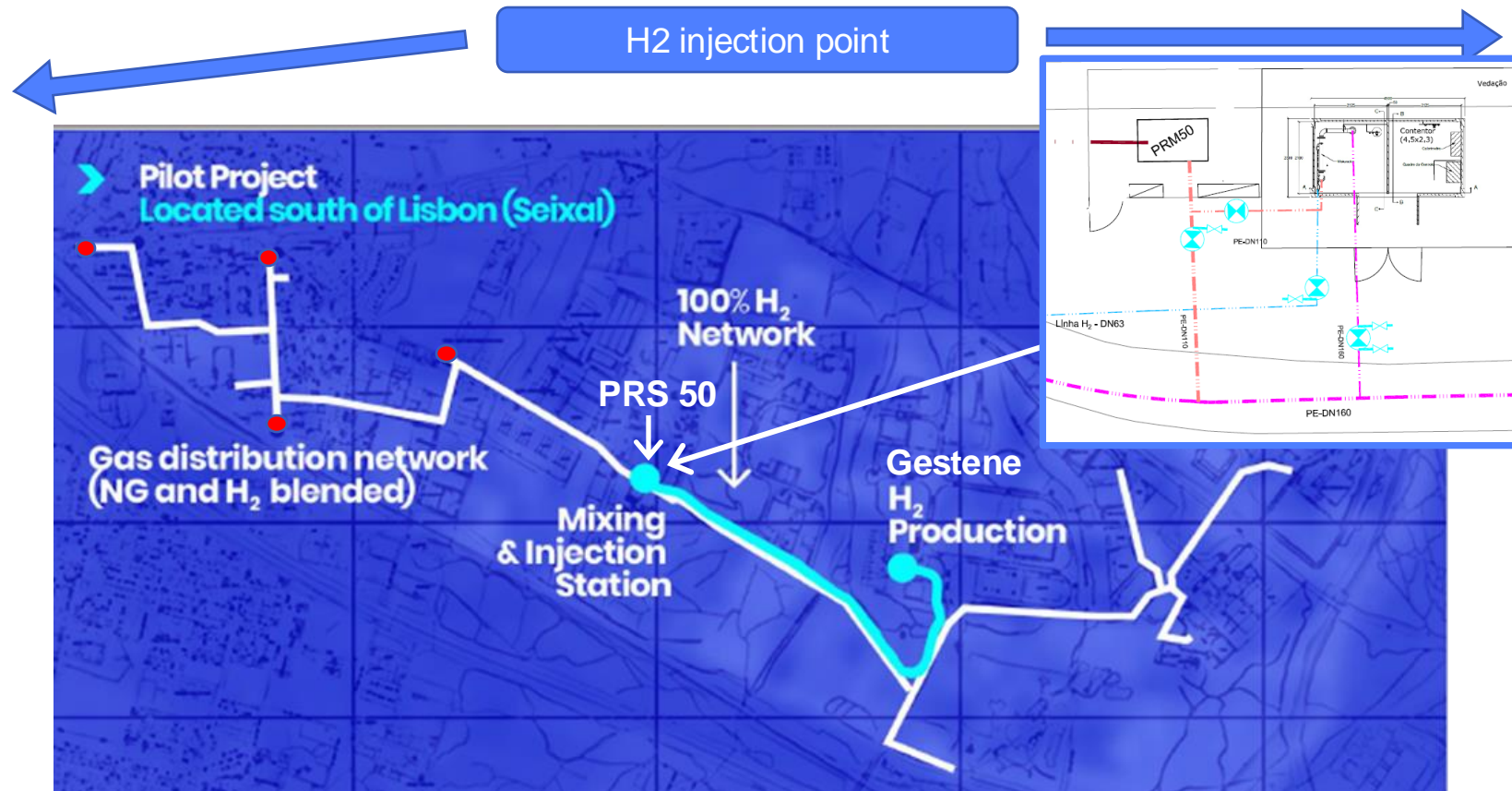
### 3 Project Concerns and Solutions



SAFETY

Operations

Utilization



### 3 Project Concerns and Solutions

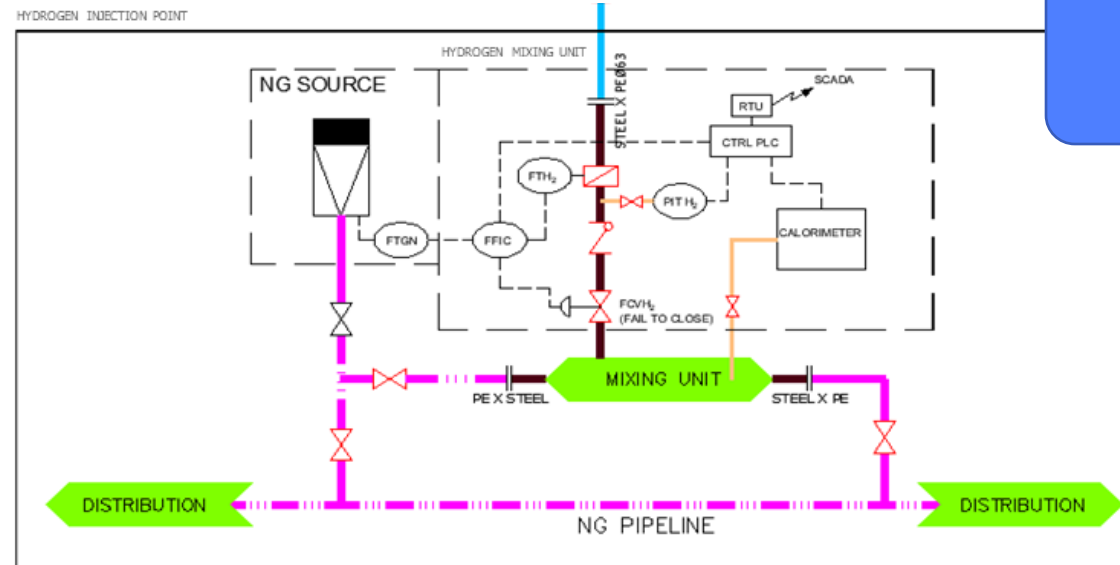
SAFETY

Utilization

Operations

- Mixture Wobbe control
- H<sub>2</sub>% control
- Ratio control ( $\text{Vol H}_2 / (\text{Vol H}_2 + \text{Vol NG}) \leq \text{chosen solution}$ )

H<sub>2</sub> % effective control



HAZOP



Fair Billing

SERVICE

Continuity of supply

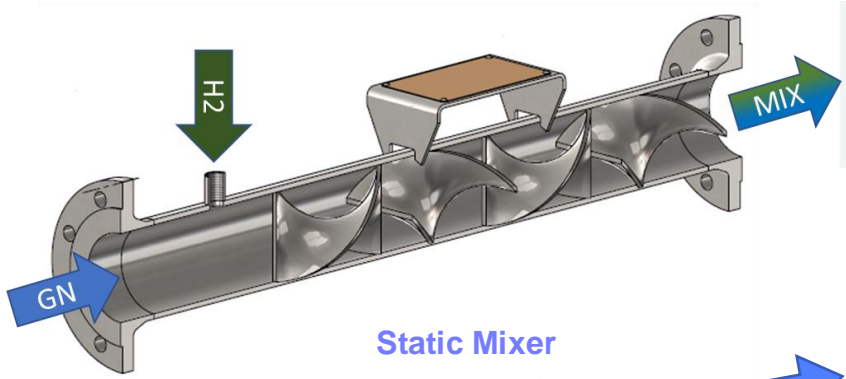


# 3 Project Concerns and Solutions

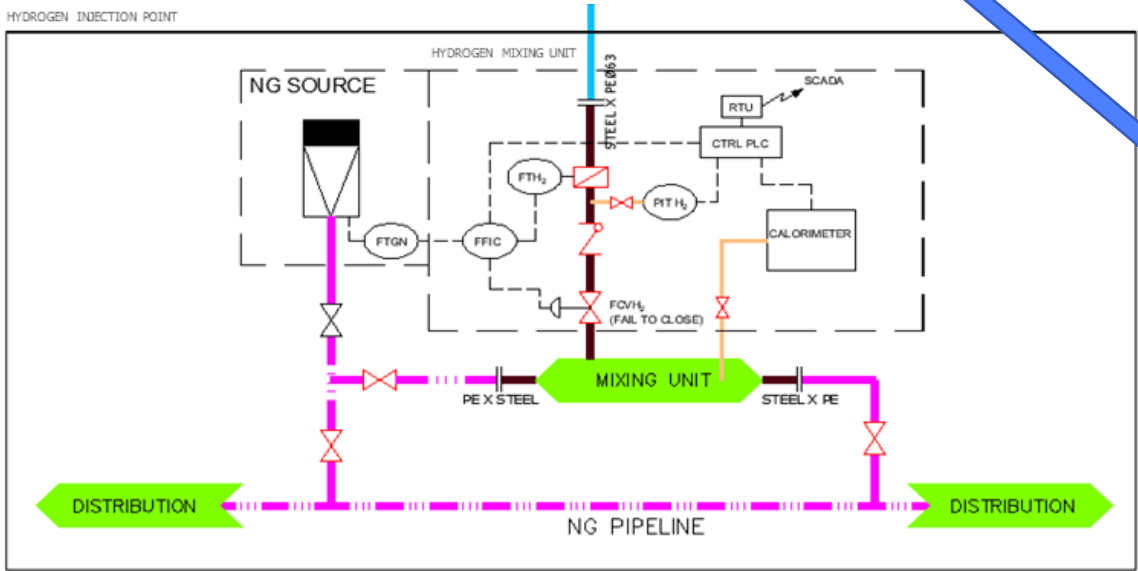
SAFETY

Utilization

Operations



NG/ H2 effective blending



Fair Billing

SERVICE

Continuity of supply



# 3 Project Concerns and Solutions



GCV measurement

GCV utilization for Billing

SAFETY

Utilization

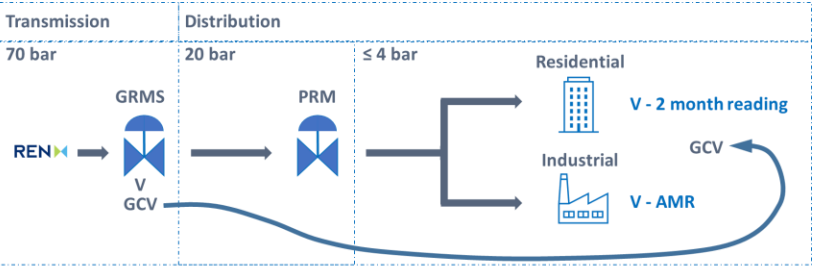
Operations

Fair Billing

SERVICE

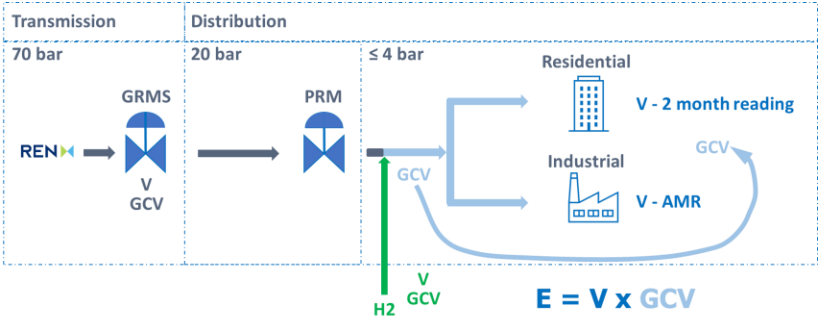
Continuity of supply

Before H2 injection



$E = V \times GCV$

After H2 injection



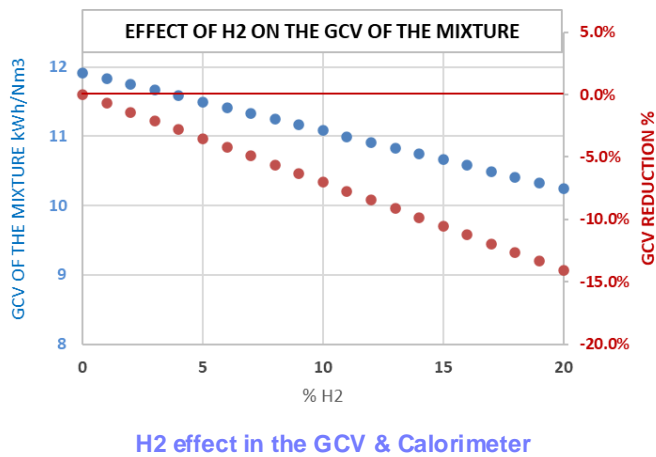
$E = V \times GCV$

# 3 Project Concerns and Solutions

SAFETY

Utilization

Operations



H2% limits safety

HAZOP



Fair Billing

Continuity of supply

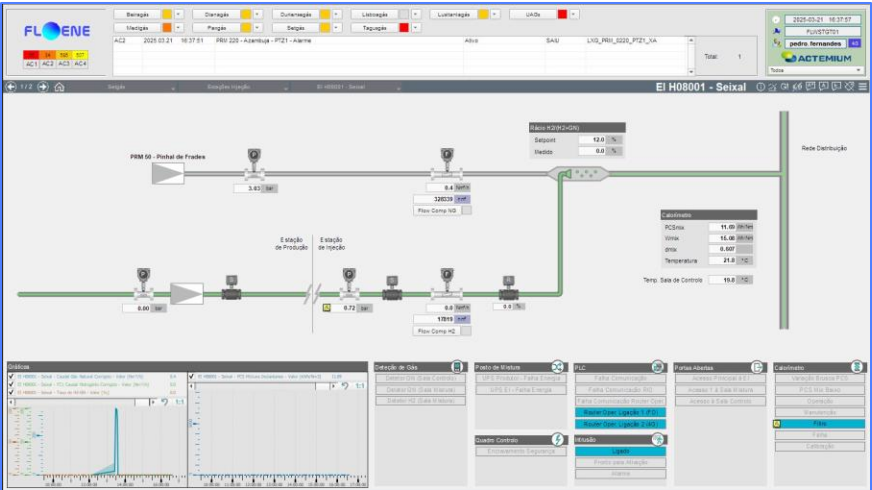
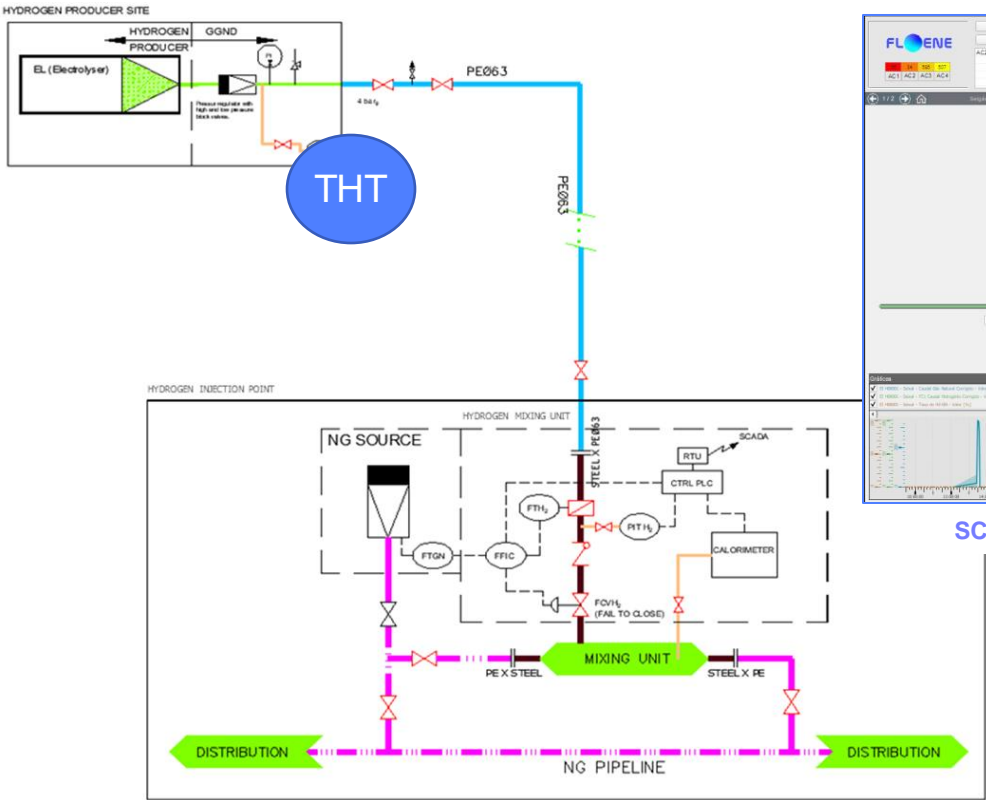
SERVICE

# 3 Project Concerns and Solutions

SAFETY

Utilization

Operations



SCADA screen

H2 pressure regulation and odorization at Gestene



HAZOP

ATEX

iSQ

Mixing station and H2 line safety

Fair Billing

SERVICE

Continuity of supply

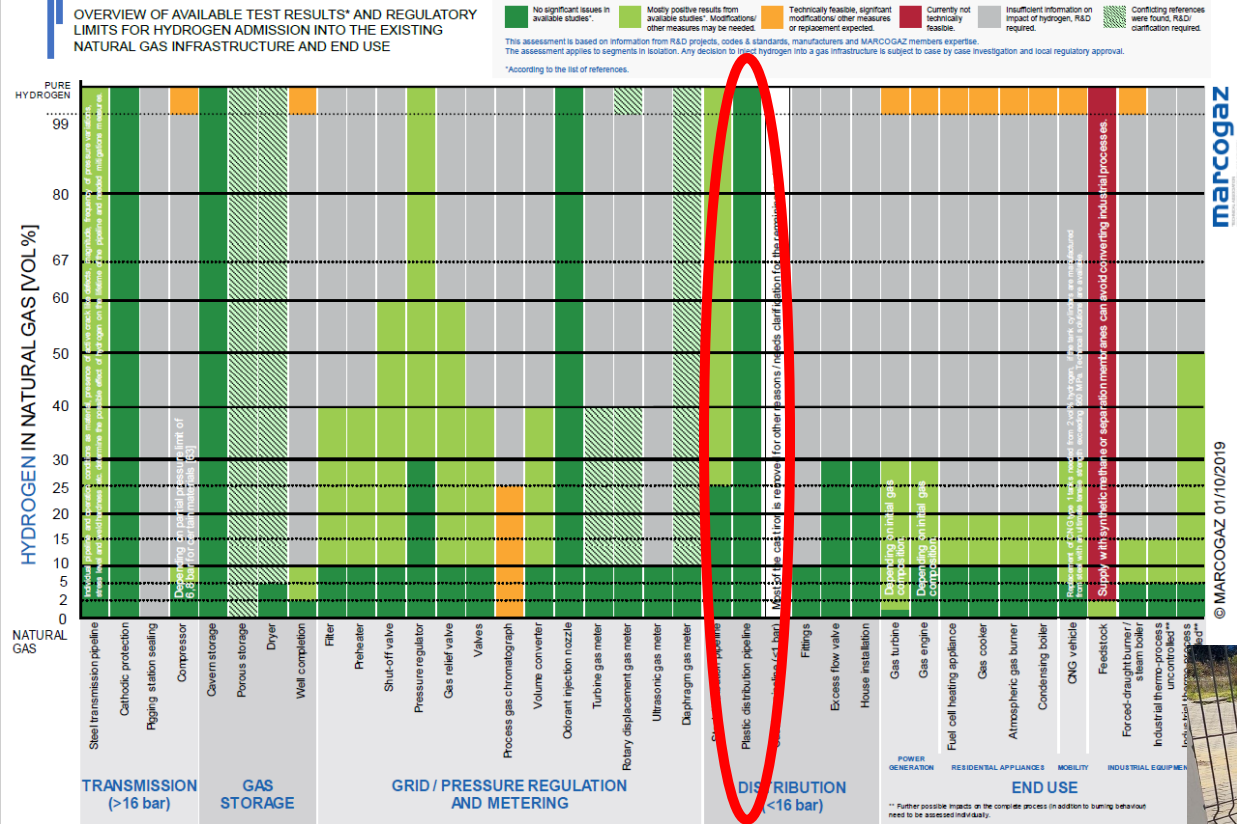


# 3 Project Concerns and Solutions

SAFETY

Utilization

Operations



H2 line material and odorization



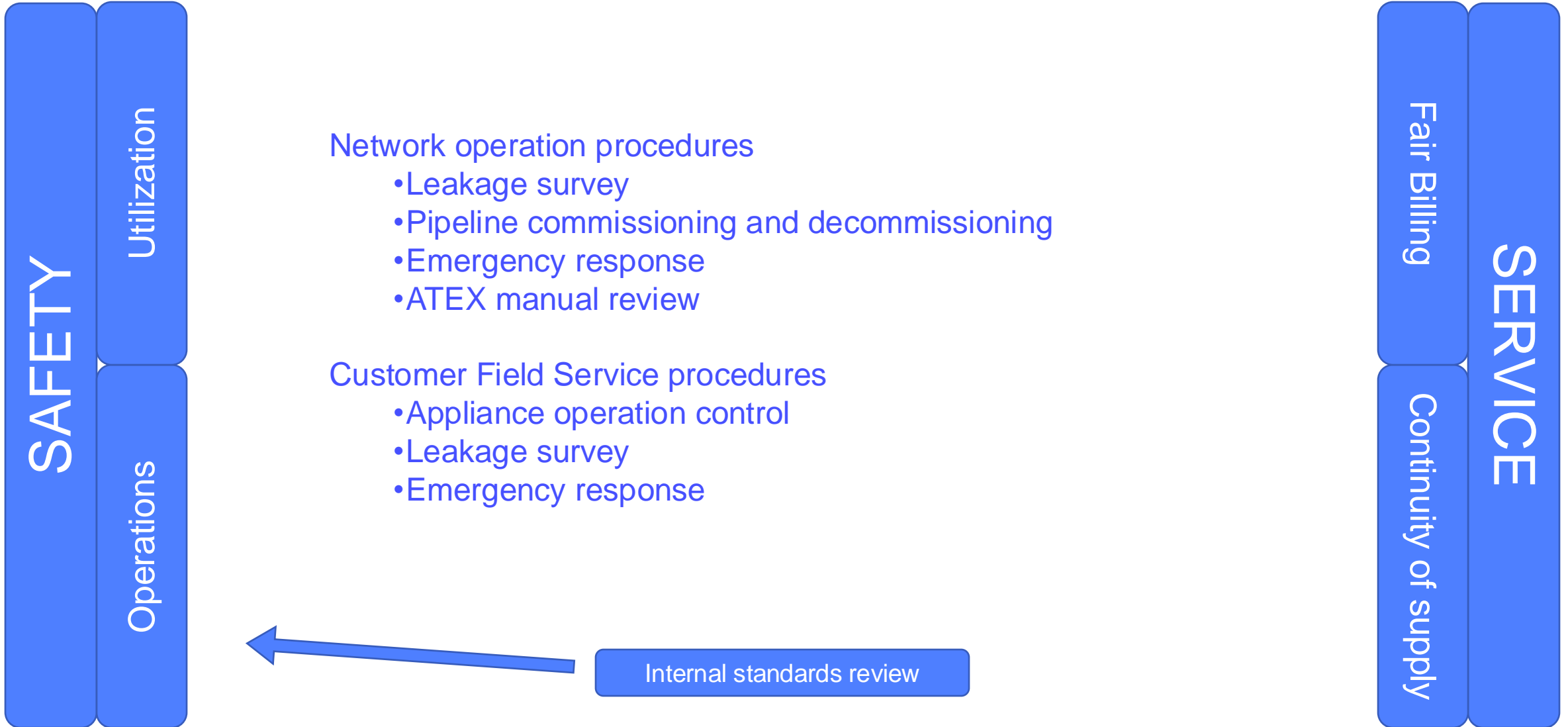
Small lapping type H2 odorization at Gestene

Fair Billing

Continuity of supply

SERVICE

### 3 Project Concerns and Solutions



## 4 Our Partners in the project

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H2 production



PRF – Gas Solutions

Mixing Station Construction



Municipality Support



Instituto de Soldadura e Qualidade

HAZOP, ATEX, Safety Inspections



GAS Appliance Supplier



# 5 Hydrogen Production and Storage

Electrolyser at Gestene



H2 Storage at Gestene



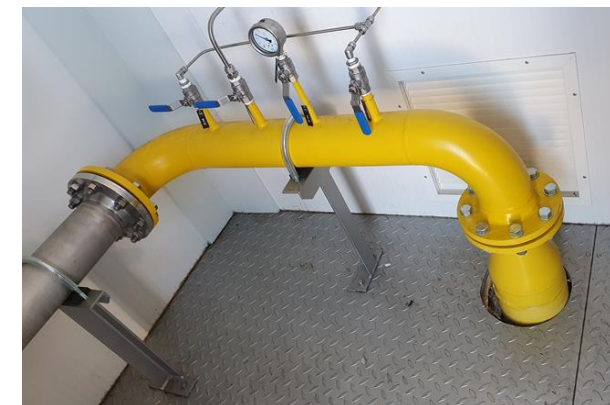
H2 pressure regulation and odorization at Gestene





# 5 Mixing Station

## Mixing station



Local Control Panel outside and inside

Calorimeter

Static Mixer

## 6 Project Status and Results

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Current H2 % = 12%



No issues with customers



Mixing station controls H2/NG percentage accurately



Billing system performs well

- Calorimeter very easy to operate and accurate
- Modifications made are suitable for future commercial projects



Station design should be improved

- Three rooms instead of two – the calorimeter is temperature sensitive and should be isolated



Floene is ready to cope with commercial H2 blending projects



## 7 H2 Promotion in Portugal

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Portugal conducted an Auction to push the development of H2 production



### Ordinance nº15/2023

Competitive procedure for the injection of H2 into the gas grid:

- **120 GWh/year** (max. support of **127 €/MWh**)
- **Contract for 10 years supply**

60 GWh / year in distribution

60 GWh / year in transmission

4 winning bidders in distribution all to inject into Floene grids

The first to go on-stream in June 2025 near Rio Maior

- 14,000 customers
- 300 Nm<sup>3</sup>/h of H2
- Max 10% H2
- 20 barg grid

# 8 Rio Maior H2 Blend Project



Piping rerouting  
and general view



Pressure Regulation  
and odorization



Control Container  
and Mixing Unit



Mixing station  
and Static Mixer



# The future is coming

With the power of The Natural Energy of Hydrogen.



DISTRIBUÍMOS ENERGIAS DE FUTURO

For further questions and clarifications:

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