

CGA Energy Nexus & Annual Technical Conference 2024

Fuelling the Future

ATCO's Journey to Net Zero: Gas Detection & Measurement Innovation

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October 7–10, 2024 | Toronto, ON | #CGATEchnicalConference #CGAEnergyNexus #FuellingTheFuture

Teledyne Confidential; Commercially Sensitive Business Data

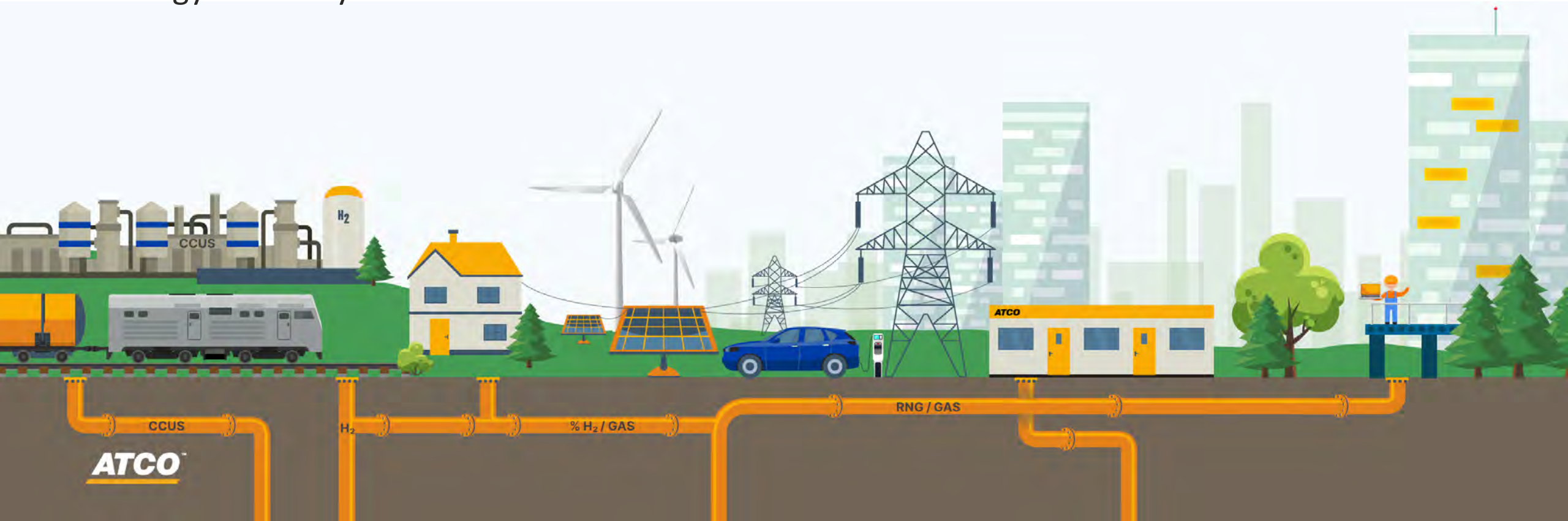
Agenda

- ATCO's roadmap to net zero & its focus on hydrogen as a cleaner fuel
- Utilizing gas detection technology to achieve our goal of Net Zero
- Teledyne GMI's hydrogen instrument development & field trials

ATCO's roadmap to net zero

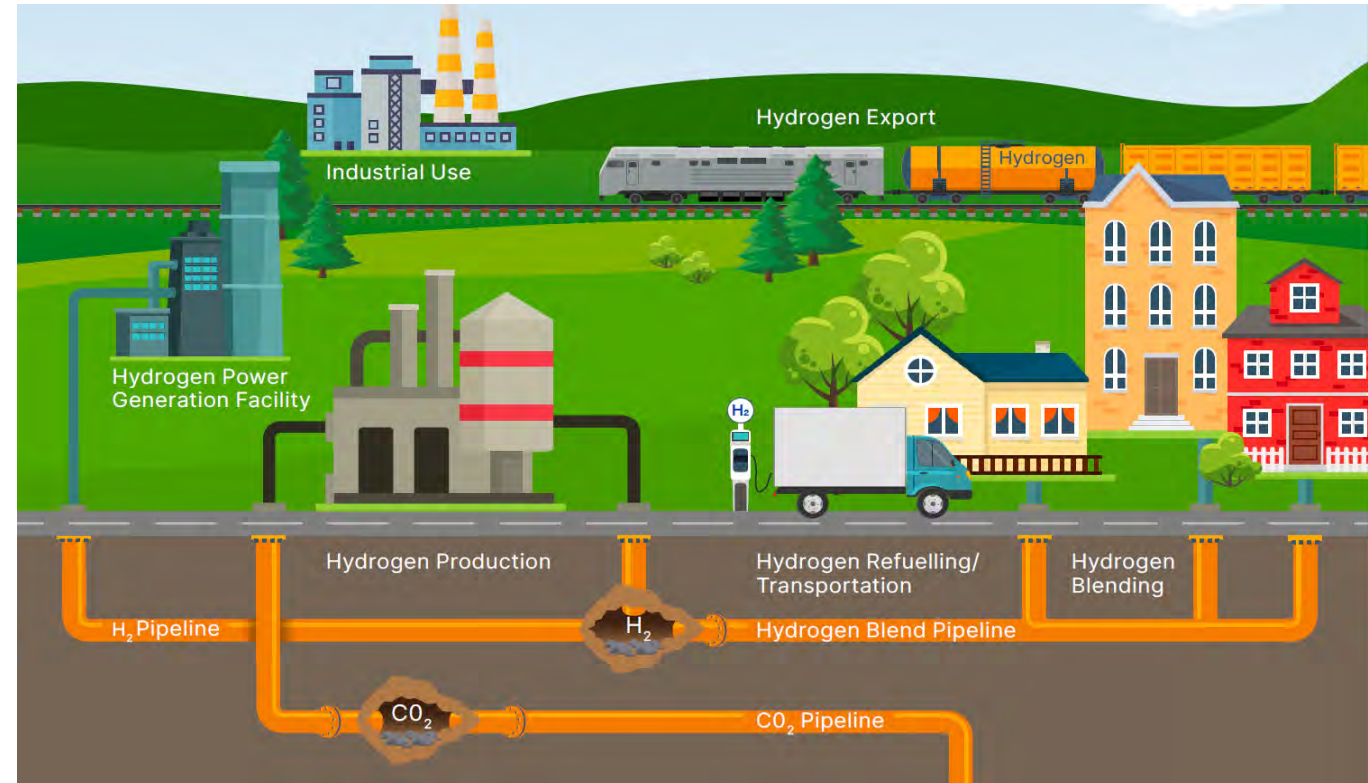
ATCO is committed to achieving net-zero by 2050 by investing in the following focus areas:

- Cleaner Fuels
- Renewable Energy
- Energy Efficiency

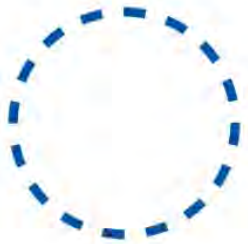


ATCO Gas's Focus on Hydrogen as a Cleaner Fuel

- Hydrogen presents an exciting opportunity for ATCO with its ability to provide energy with a lower carbon intensity
- By repurposing our existing distribution system, blending low-carbon fuels continues to be as cost effective as possible
- To date, ATCO is heavily involved in blending hydrogen into our systems in our companies based in Canada and Australia



ATCO Gas's Focus on Hydrogen as a Cleaner Fuel



Colourless, odorless, tasteless, non-toxic and non-poisonous.



When burned, H₂ produces water vapour and no carbon emissions.



A cost-effective decarbonization pathway for heating in Alberta and around the world.



An efficient way to store and transport energy.

ATCO's Hydrogen Expertise

- Heavy focus on hydrogen blending in the City of Fort Saskatchewan
- Starting in late 2022, ATCO began injecting H₂ at a rate of 5% into a portion of Fort Saskatchewan's natural gas distribution system to ~2,100 customers
- ATCO is projecting to increase this blend to 20% by Q1 2025



ATCO's Hydrogen Expertise

- ATCO in collaboration with homebuilder Qualico is examining the feasibility of a 100% H2 community
- In 2024 we commissioned the first 100% hydrogen home in the City of Sherwood Park, Alberta
- A future home to 85,000 residents, this community will be a Canadian first, and globally the largest scale project of its kind





The role of Gas Detection in achieving Net Zero

Gas Detection and its critical requirement for Operations

- Gas detectors are required for conducting critical Health and Safety tasks
- These tasks include the following:
 - Responding to CO calls
 - Responding to odor calls
 - Responding to hit lines
 - Completing final checks on meter set installations





Collaboration with Teledyne GMI for H2 Device Testing

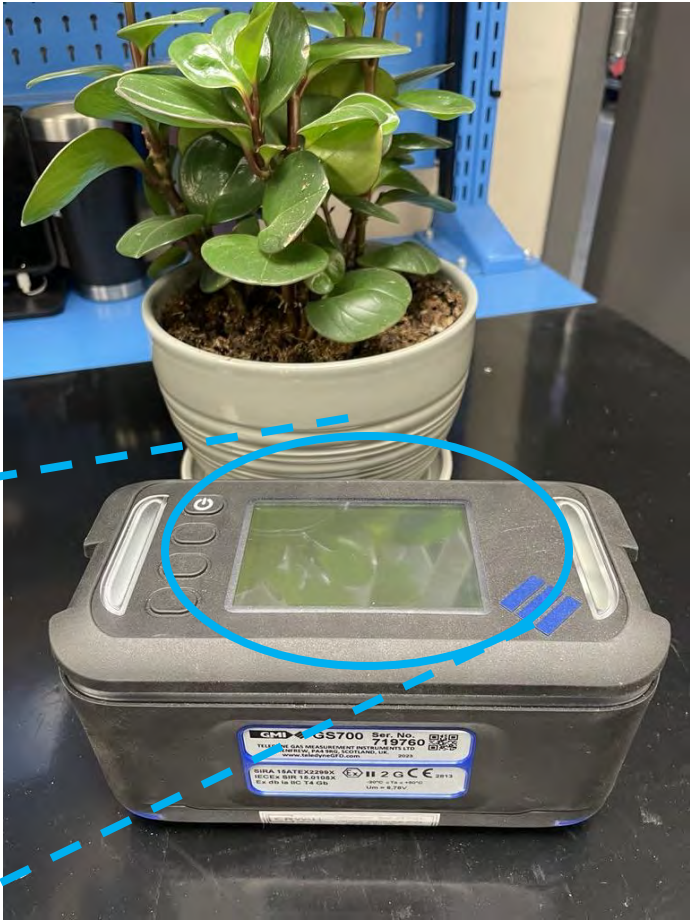
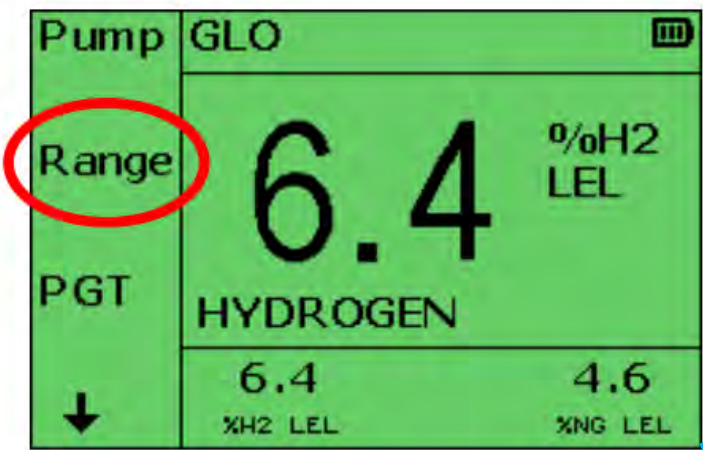
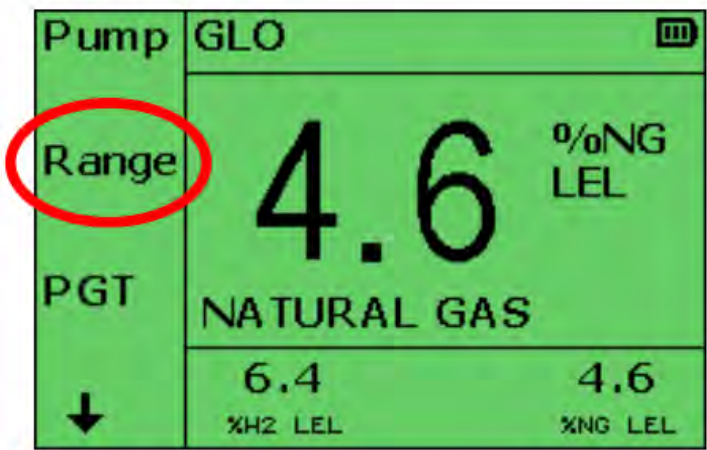
- ATCO Gas began working collaboratively with Teledyne GMI to test and evaluate a hydrogen compatible device for the following:
 - Blended Gas Applications
 - 100% H2 Detection
- Testing was conducted at ATCO's Gas Lab in Edmonton, Alberta



H2 Compatible GMI Device Testing

Testing was completed with the following gas samples:

Gas Sample Number	Composition
#1	100% Hydrogen
#2	5% Hydrogen, 95% Natural Gas
#3	20% Hydrogen, 80% Natural Gas



H2 Compatible GMI Device Testing – 5% H2, 95% Natural Gas



H2 Compatible GMI Device Testing – 20% H2, 80% Natural Gas

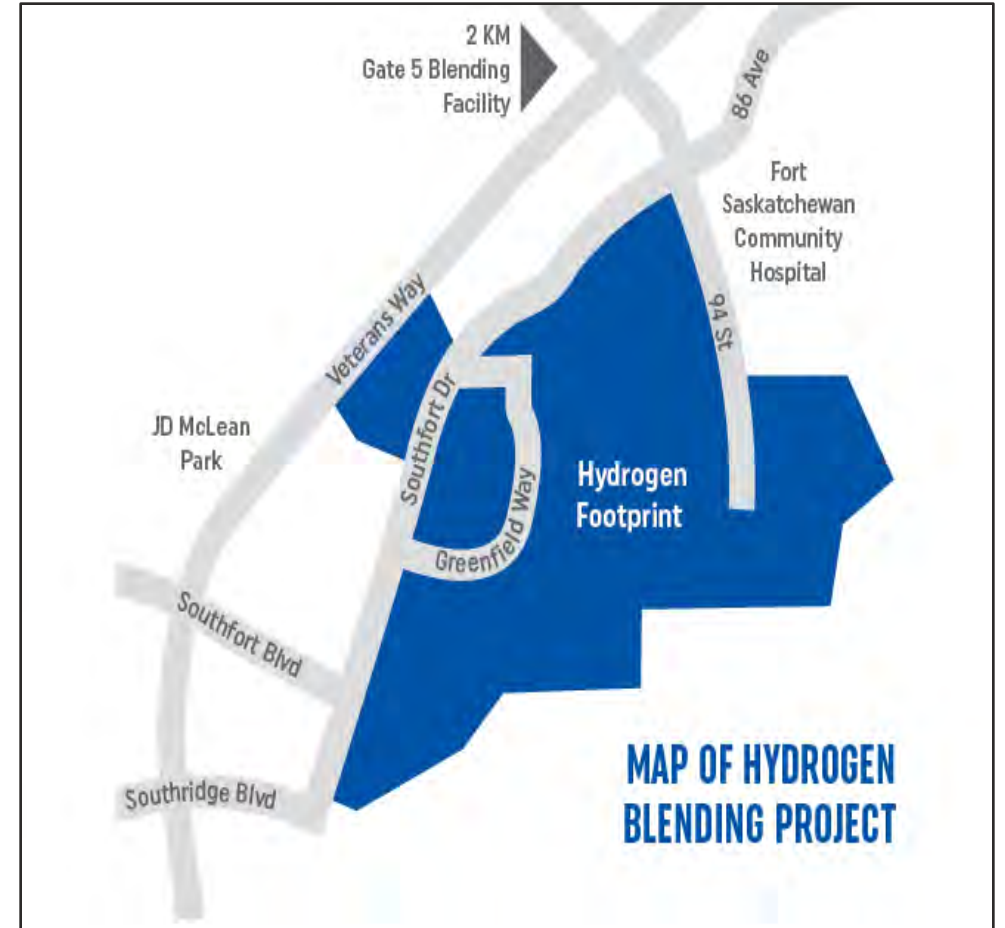


H2 Compatible GMI Device Testing – 100% Hydrogen



Field Implementation

- ATCO Gas was successfully able to commission our 100% H2 home with GMI's GS700-H2 in July 2024
- The device is currently being onboarded into the ATCO Gas fleet for our service territory in the City of Fort Saskatchewan which will provide a 20% H2, 80% NG blend to over 2,100 customers
- We note that operators will not have CO sensing capabilities with this unit, however they will have separate personal monitors
- Over to **Patricia** to review the GS700-H2 technical journey!



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Fuelling the Future

Gas Detection Measurement & Innovation



Teledyne GMI: Hydrogen Technical Journey - Project Overview

1. HyDeploy (1 & 2)

- Blended H2 project
- Up to 20% H2
- “Not less safe than Natural Gas”... HSE



hydeploy.co.uk

2. H100

- SGN (UK)
- 100% H2 and H2 blend project
- 2024 for gas in pipelines (test location, Scotland)



Hydrogen Project – HyDeploy (2020)



- Blending up to 20% Hydrogen
- Stage 1 - Keele University – ‘isolated’ test site
- Stage 2 – NE England – wider variety of customers
- Initial instrument requirement – to measure HC content and detect leaks – safety case.
No Hydrogen detection required
- UK -Assumption 100% LEL is 5%Gas



Hydrogen Project – HyDeploy (2020)



- Instrument - **Not analytical** – safety case
- **GS700** chosen
- IR for hydrocarbon content
- SemiConductor Sensor for leaks
- Ranges : ppm (SC); LEL; Vol Gas, O2
- **No CO** (cross sensitive H2)



GS700 Instrument

Hydrogen Project – SGN H100 – (2020-2023)



- 100% Hydrogen (and blends) - SGN
- Test location – Scotland (Fife)
- Instrument requirement:
 - ✓ H2: ppm → 100% Gas, blends
 - ✓ NG: ppm → 100% Gas
- GMI partnership with SGN
- [ATEX](#) Certified Instrument – obtained 2023
- Field Trials – multiple / extensive



Hydrogen Project – Instrument Requirements



- Measure 100% NG, 100% H₂ and blends
- GS700 based
- Natural Gas – IR sensor
- Hydrogen – custom TGMI sensor

Sensor	Nat Gas - Response?			Hydrogen - Response?		
	ppm	lel	Vol Gas	ppm	lel	Vol Gas
IR	Y	Y	Y	X	X	X
Catalytic	x	x	x	Y	Y	Y
TC	response is ~20% of H ₂			Y	Y	Y



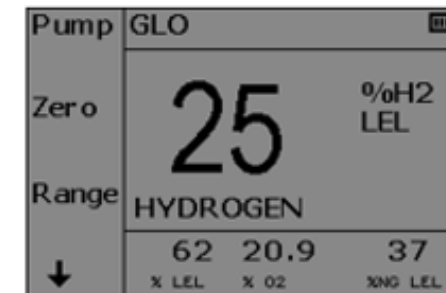
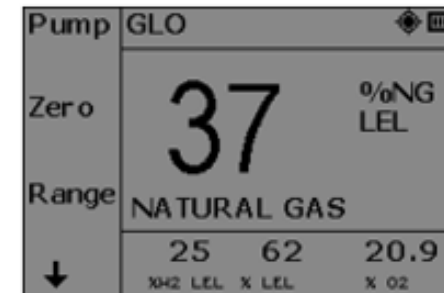
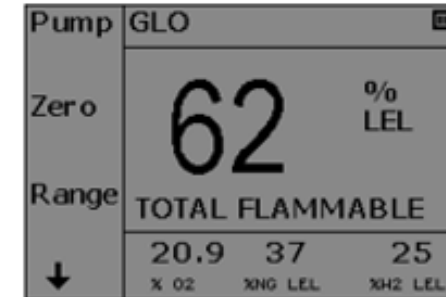
- 4 sensors allow gas readings for NG, 100% H₂ and H₂ blends to be fully evaluated

H100 – User Interface



User presses “Range” to easily access:

- TOTAL FLAMMABLE reading
natural gas (37%) + hydrogen (25%)
- NATURAL GAS reading
- HYDROGEN reading



GS700 - 100% H2 and H2 Blends

Instrument development completed 2022

- ✓ H100 project – extensive field evaluations
Simplified user interface
- ✓ Accuracy - 100% H2 and 20% blends
[BS-EN60079-29-1](#)
- ✓ Supporting global hydrogen projects



H100 Project – GS700 Instruments delivered Q3-2023

Field Trial 1 – 100% H₂

UK Hydrogen Test Facility (DNV)

Network of pipework, 2 houses (100% H₂)

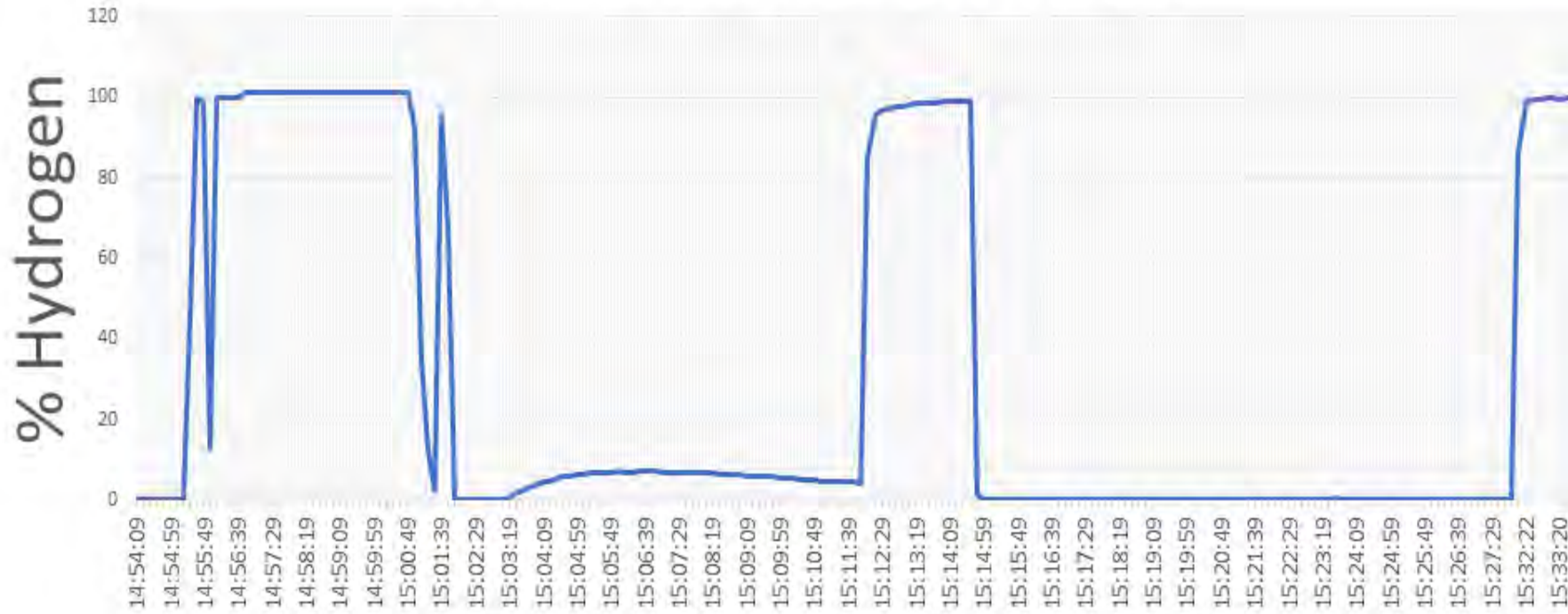


GS700-Hydrogen used for:

- Leak Survey
- Leak Investigation
- Barholing
- Purging

“...Over the range of the instrument, concentrations were **accurate** within **1 %**. This calibration check was carried out periodically during the test program and no change was noted...”

Tues 11th August (14_42_38) Purging



Field Trial 2 – Commissioning 100% H2 Boilers

UK Hydrogen Test Facility (DNV)



GS700-H2 used for:

- Leak Investigation
- Purging

*“...very **impressed** with kit and feel it **meets** all of our development **requirements**”...*”

Field Trial 3 - 100%H2

Hy4Heat - Department of Business Energy and Industrial Strategy ([BEIS](#))



Vol H2	GMI reading
% vol H2	% vol H2
0.0%	0%
9.8%	9%
18.8%	18%
27.2%	27%
36.9%	37%
47.0%	46%
57.1%	57%



GS700-Hydrogen used for:

- PPM / LEL tracking – [room dispersion](#)
- Purging

“...The readings from this were expected to be more dependable, consistent, and accurate. It is also able to reliably detect higher concentrations of hydrogen than the [xxx] sensors...”

Field Trial 4 - Hydrogen Homes (UK)



NGN - Multiple Houses, 100% H2



GS700-Hydrogen used for:

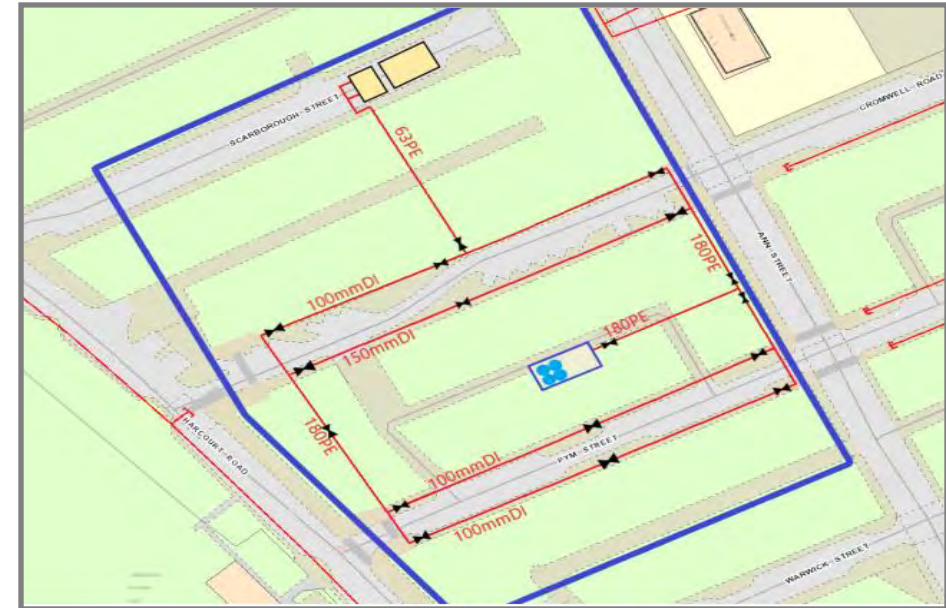
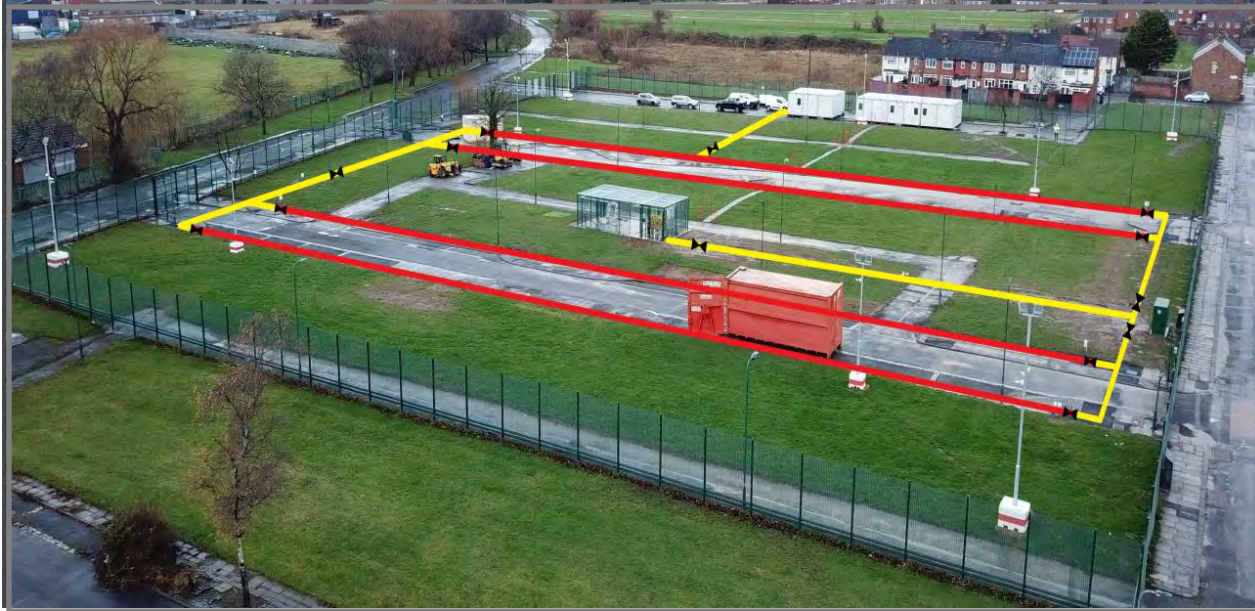
- All typical FCO activities
 - ✓ Leak checks around hydrogen storage
 - ✓ Survey of mains and services
 - ✓ Building access points

*“...device was **absolutely superb** and to be honest we would have struggled without it. We encountered leaks on fittings that were only found with the device and when it came to purging it was the **only machine** that would get **to 100%** gas...”*

Field Trials 5- Effect on H2 on pipe material



H21 Phase 2b: UK - Existing site with mix of old / new pipes



GS700-Hydrogen used to support project activities:

- ✓ Indirect / Direct Purging - Commissioning / Decommissioning / Branch Purging / Conversion Style Purging
- ✓ Finding Leaks - Gas detection / Barholing / Rock Drilling
- ✓ Accessing Leaks - Atmospheric Sampling / Dispersion Monitoring
- ✓ Live Gas Operations - Under Pressure Drilling / Live Service Insertion / Live Mains Insertion
- ✓ Flow Stop - Squeeze Off / Bag Stop / Service Isolation

Field Trials 5- H2 and pipe material

H21 Phase 2b: UK - Existing site with mix of metallic & PE pipe



GS700-H2 Next Steps



- North American Certification (Q4/2024)
- Evaluate / integrate H2 tolerant CO sensors
- Evaluate / integrate H2 tolerant O2 sensors



ATCO's Journey to Net Zero: Gas Detection & Measurement Innovation

Where do we go from here?

Thank you!