



# **Validation of ISO 6974 for the measurement of the composition of hydrogen-enriched natural gas**

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# Hydrogen-enriched natural gas

- Produced from electricity from wind farms
- At times with limited demand: conversion of power into hydrogen



# Power to gas

- Hydrogen blended with natural gas by injection into the gas grid
- Meanwhile also experiments to convert power into methane



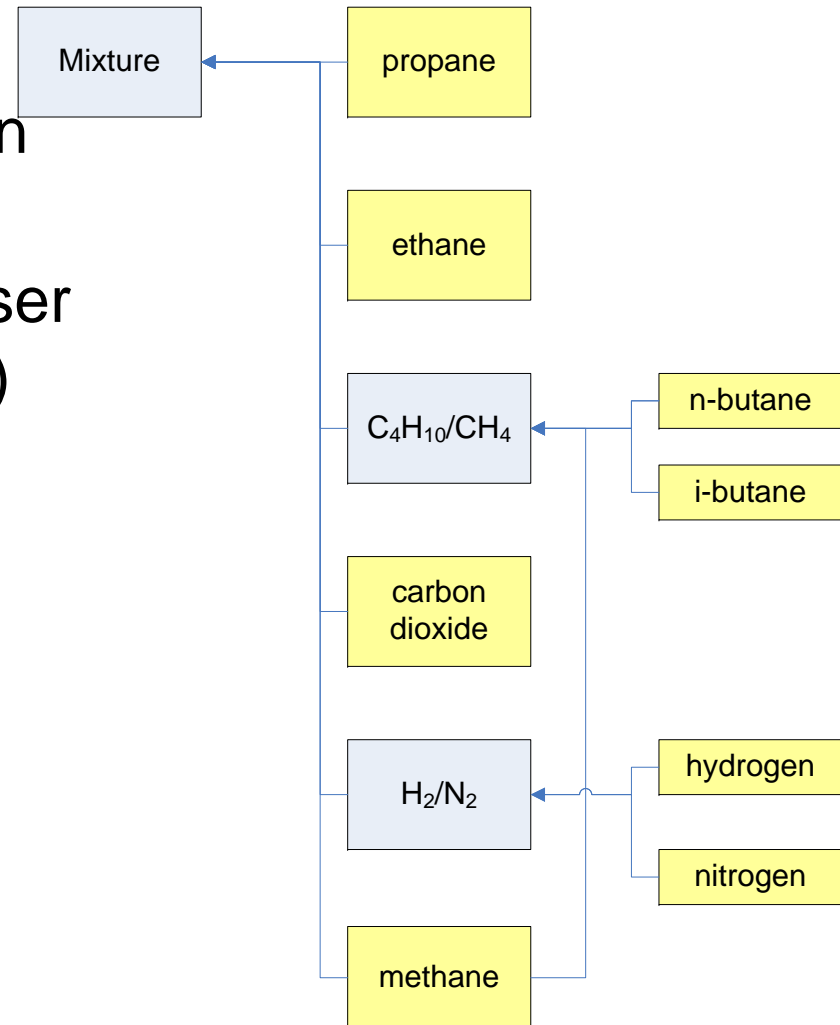
# Regulatory framework and objectives

- EN 1776 sets a framework for natural gas custody transfer
- ISO 6974 is referenced as standard for composition analysis
- Fraction hydrogen: 3 % - 16 %
- In EMRP ENG01 “Characterisation of Energy Gases”, one of the aims was to validate ISO 6974 for blends of hydrogen and natural gas



# Gas mixture preparation

- Basis: ISO 6142
- Multistage preparation
- Combination of high-purity gases, and lesser pure liquids (butanes)
- Preparation in accordance with regulatory framework



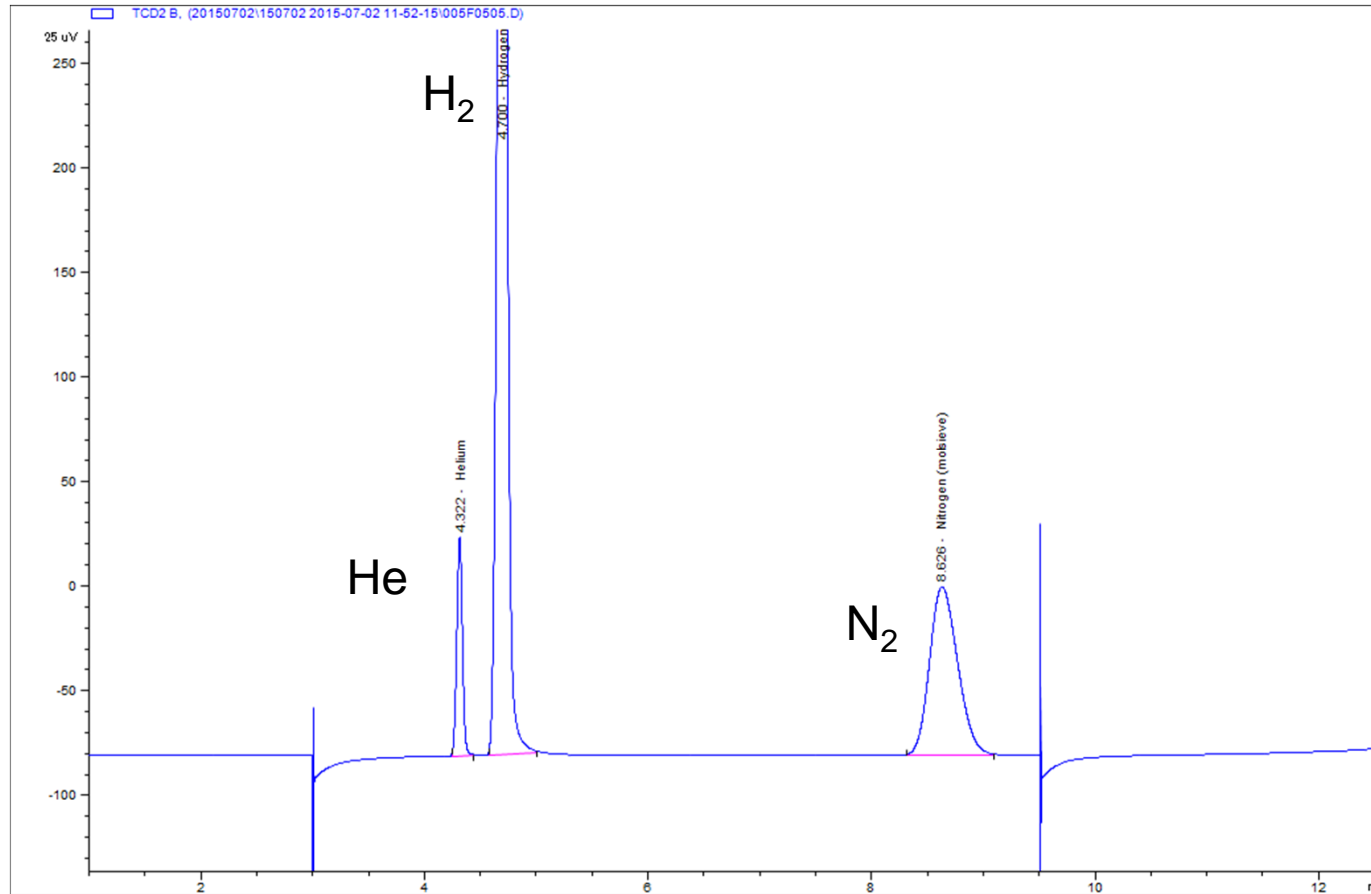


# Analytical method

- GC measurement, using TCD
- Hydrogen is measured on the same channel as helium
  - NGA, using a Molsieve 13A and TCD
  - RGA, using a Molsieve 13A and TCD
  - Measurement on RGA includes trapping hydrogen prior to elution and detection

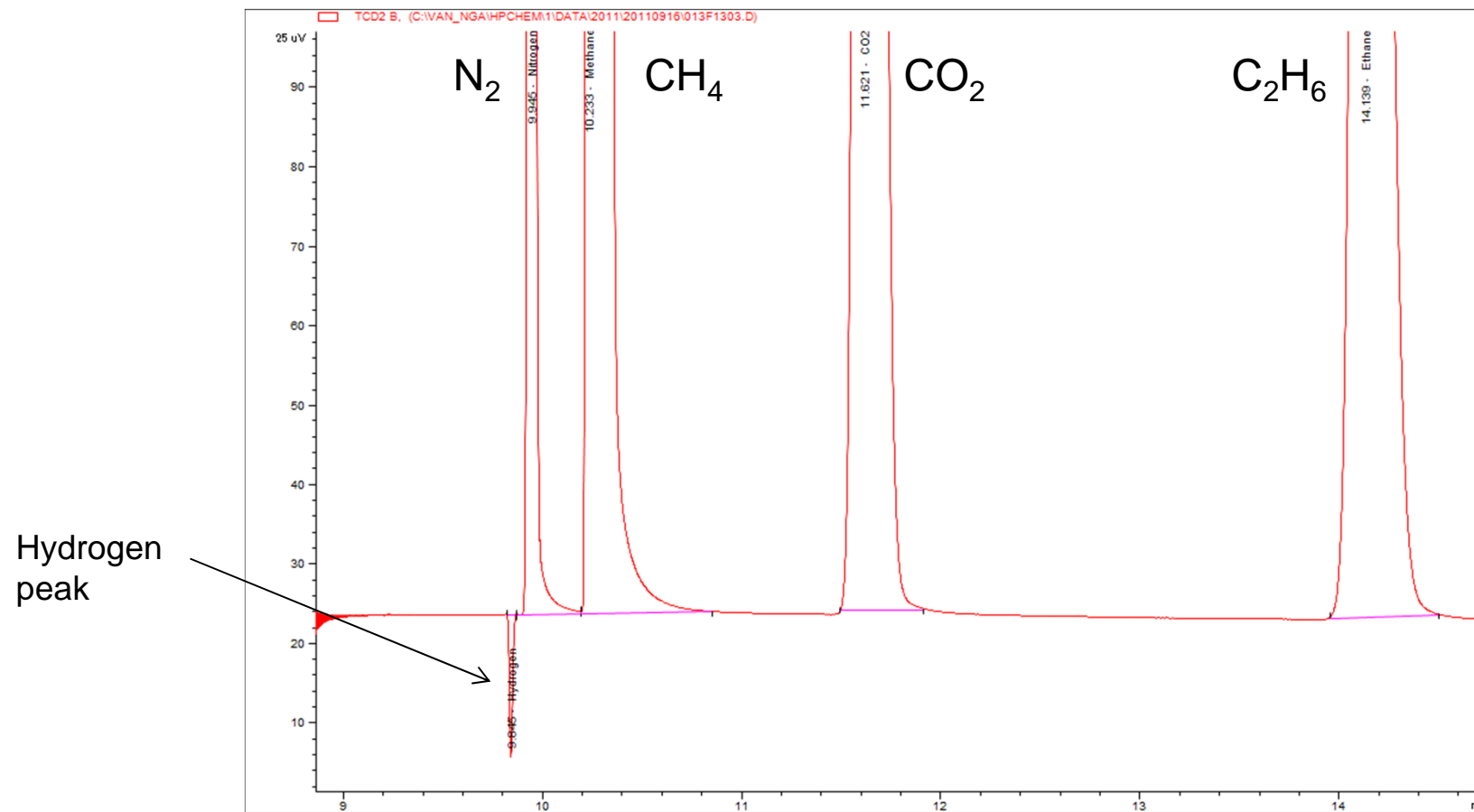


# Peak separation (NGA)





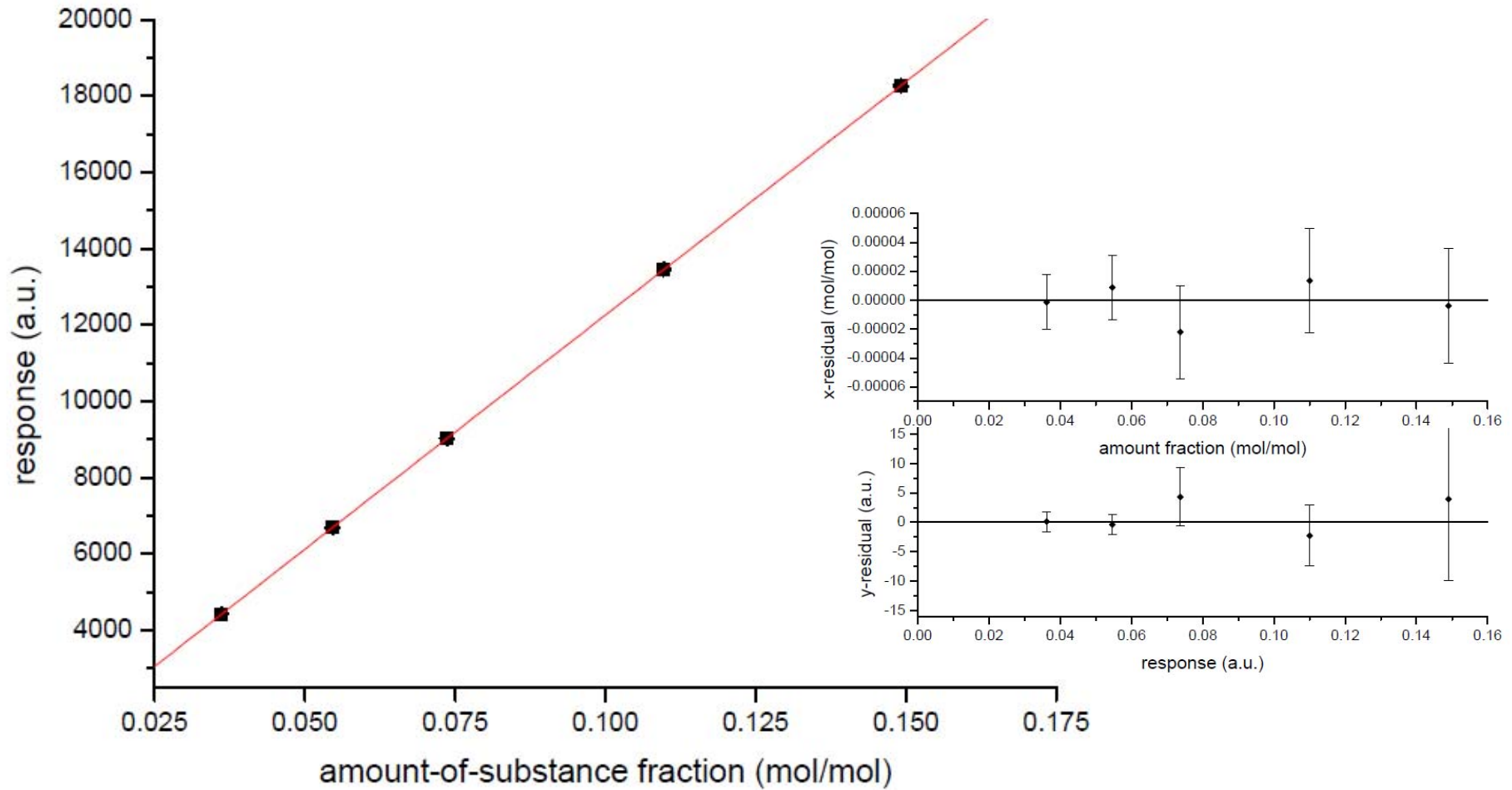
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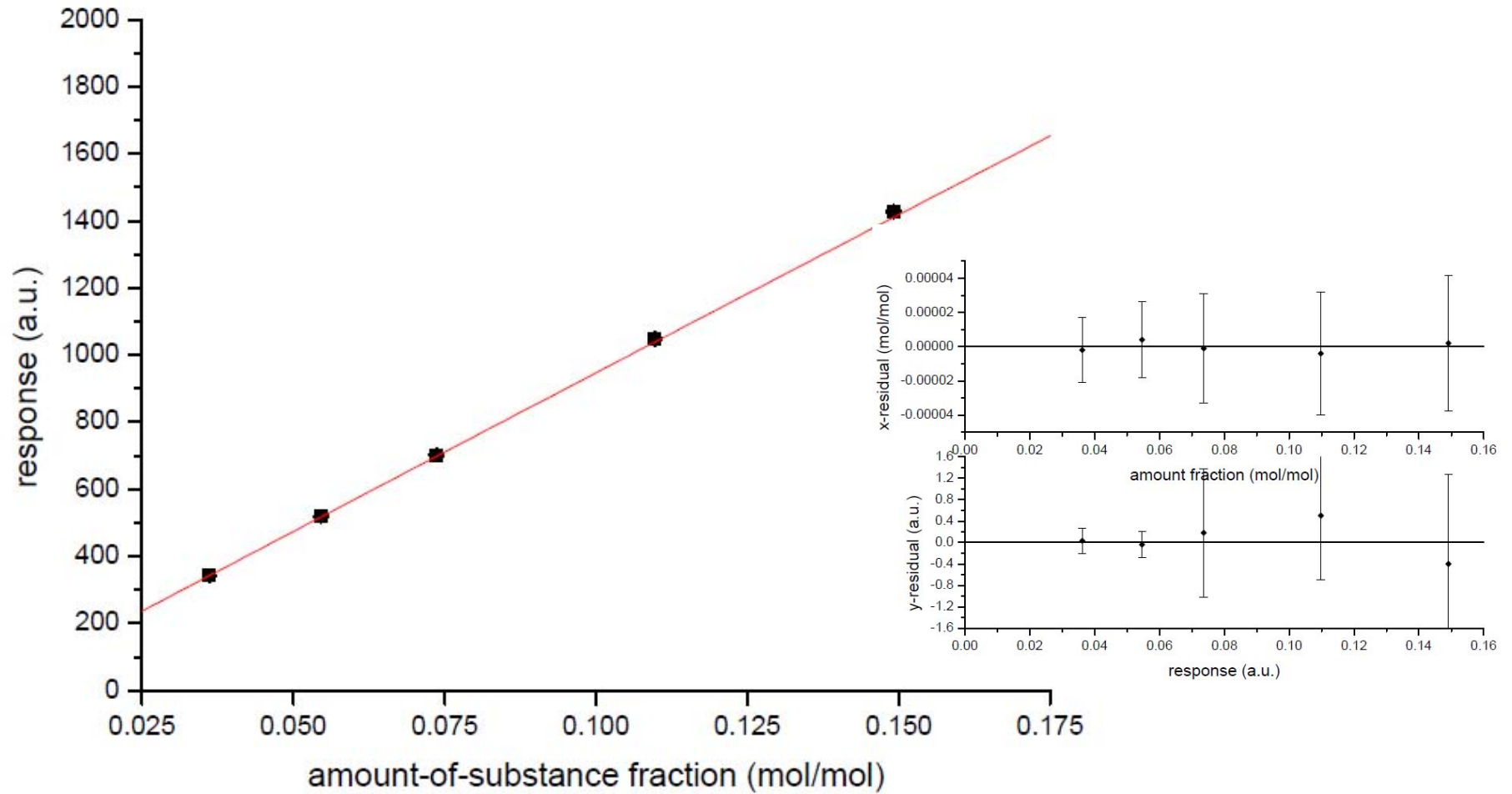




# Fitting results NGA



# Fitting results RGA





# Matrix influence and stability

Mixture	Matrix	Preparation date
VSL124437	argon	16/05/2003
PRM126842	methane	15/03/2003
VSL305164	nitrogen	21/01/2011

RGA

NGA

Mixture	$x$ cmol/mol	$U(x)$ cmol/mol	$E_n$	$x$ cmol/mol	$U(x)$ cmol/mol	$E_n$
VSL124437	3.800	0.004	0.14	3.794	0.003	-1.42
PRM126842	4.996	0.008	-0.82	4.998	0.004	-0.98
VSL305164	9.988	0.012	-0.19	9.987	0.005	-0.53



# Conclusions

- Analysis of hydrogen in natural gas is not particularly challenging
- NGA provides better results than RGA
- Expanded uncertainty 0.12% - 0.20%

