


Gas Quality
The effects of hydrogen on Wobbe Index

Joint CEN-ENTSOG Workshop on Wobbe Index and Gross Calorific Value in the European gas value chain

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Jose A. Lana / Jos Dehaeseleer

Storage of surplus of renewable energy

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Sharp growing of renewable power generation

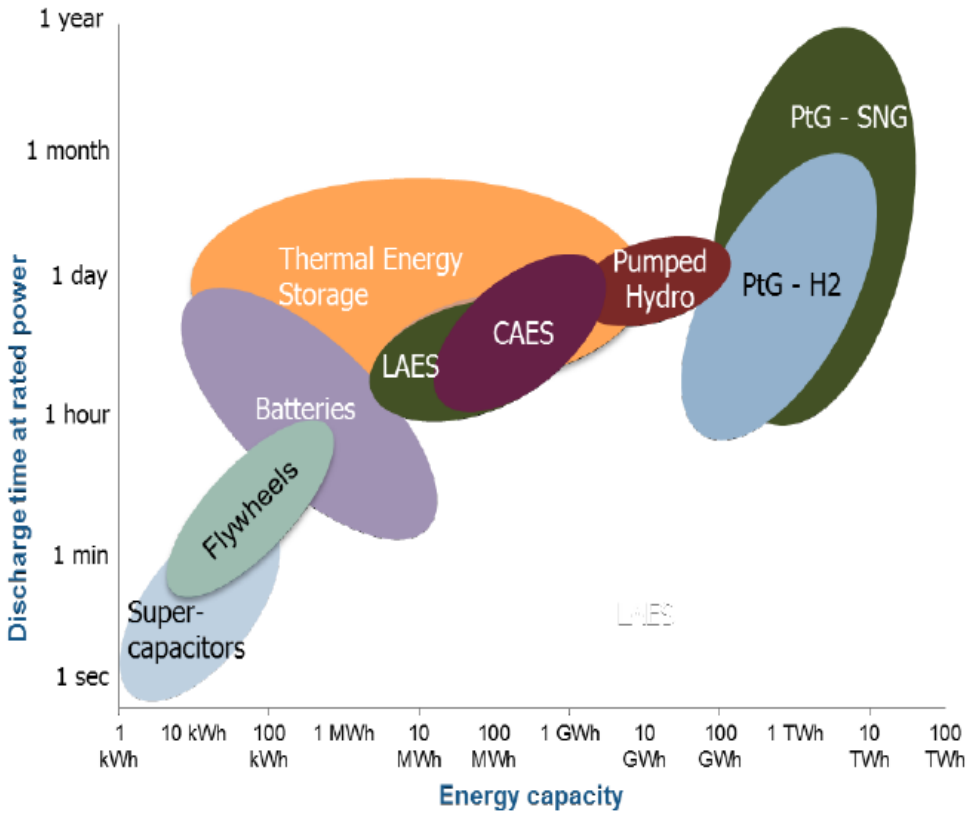
- *Peak power production generates curtailments*
- *Renewable power is intermittent*

Need for power storage

Different technologies available

- *Many of them under development*

Hydrogen is an option



Source: World Energy Council, 2016

Why hydrogen?

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Allow long term storage and transport of surplus of renewable energy

Hydrogen is an energy vector

Different utilization options:

- *Use in hydrogen application: heat, mobility, raw material, …*
- *To transform in another fuel: methane, methanol, liquid fuels*
- *Injection into the natural gas network*

Why injecting hydrogen in the natural gas grids?

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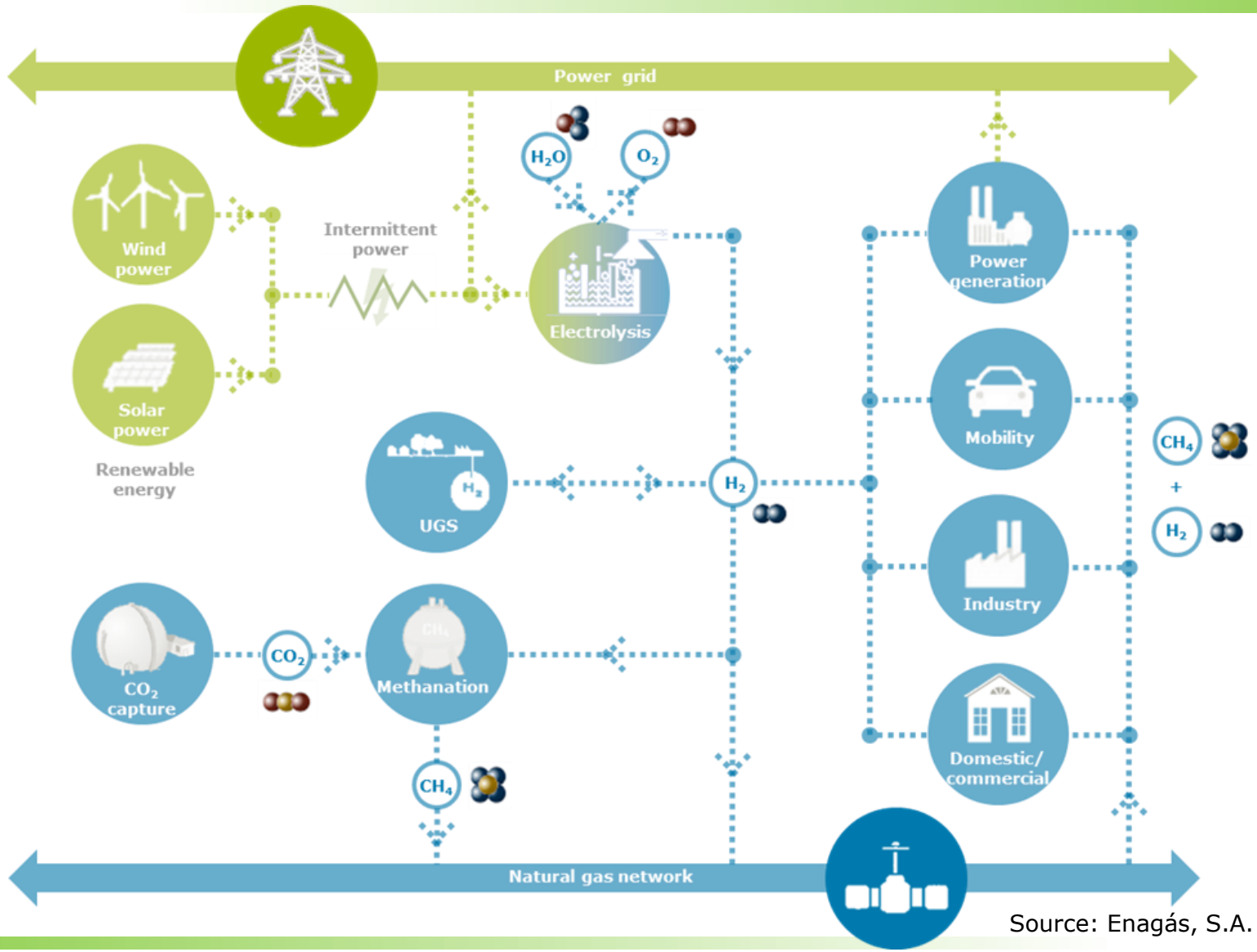

Source: Enagás, S.A.

Reasons behind injection of hydrogen in the natural gas grid

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Allow to use the large storage and transmission capacity of natural gas networks

The natural gas infrastructures already exist and their capillarity along European territory allows connecting almost any production-utilization point

Natural gas infrastructure operators and associations are strongly committed to support the integration of renewable gases in their grids

Contribution to reduce the CO_2 footprint of natural gas utilization

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Hydrogen main combustion properties vs natural gas (pipeline/LNG origin):

	Pipeline NG	LNG	H_2
Hs (MJ/m^3)	39.67	41.26	12.10
WI (MJ/m^3)	50.73	52.35	45.88
Rel. Density	0.6114	0.6211	0.0696

(15°C/15°C conditions)

- *Higher combustion velocity*
- *Higher flame temperature in stoichiometric combustion*

Effect of adding hydrogen to natural gas

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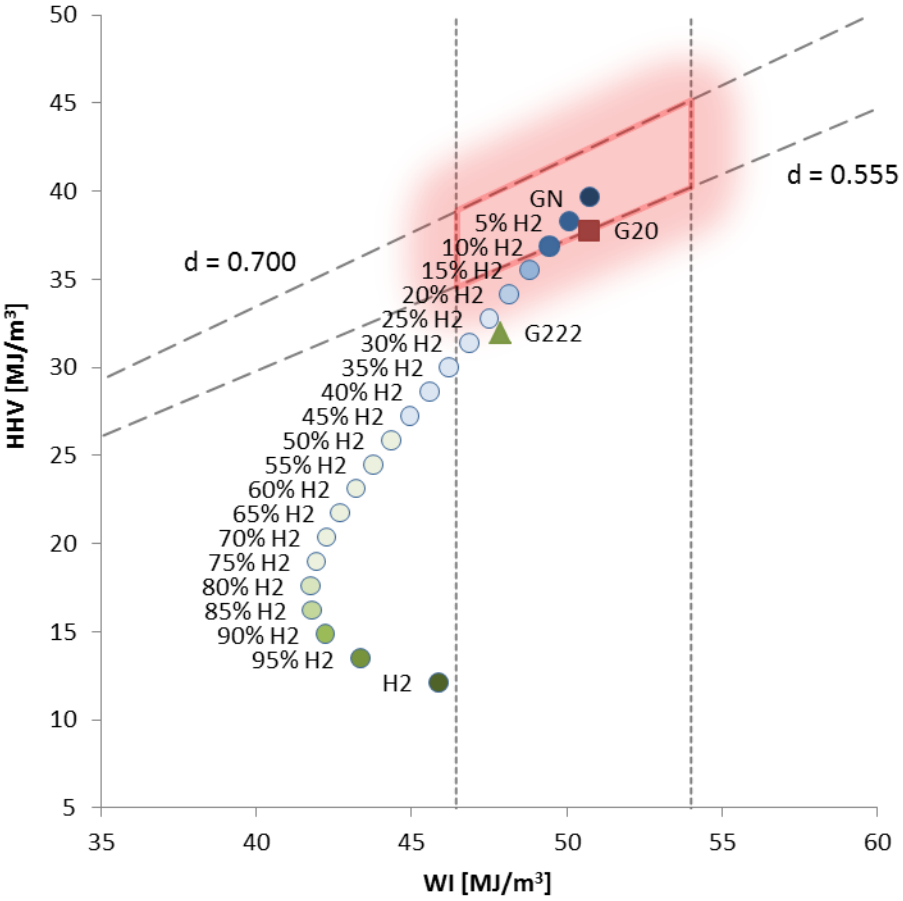
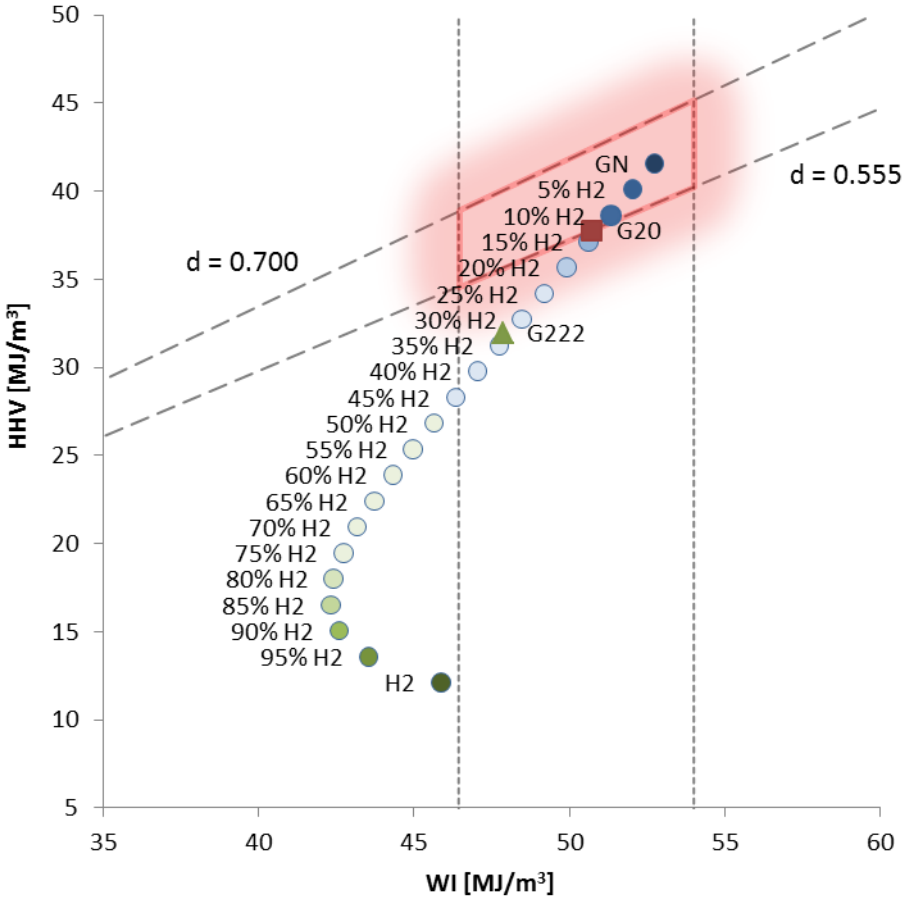
Pipeline natural gas

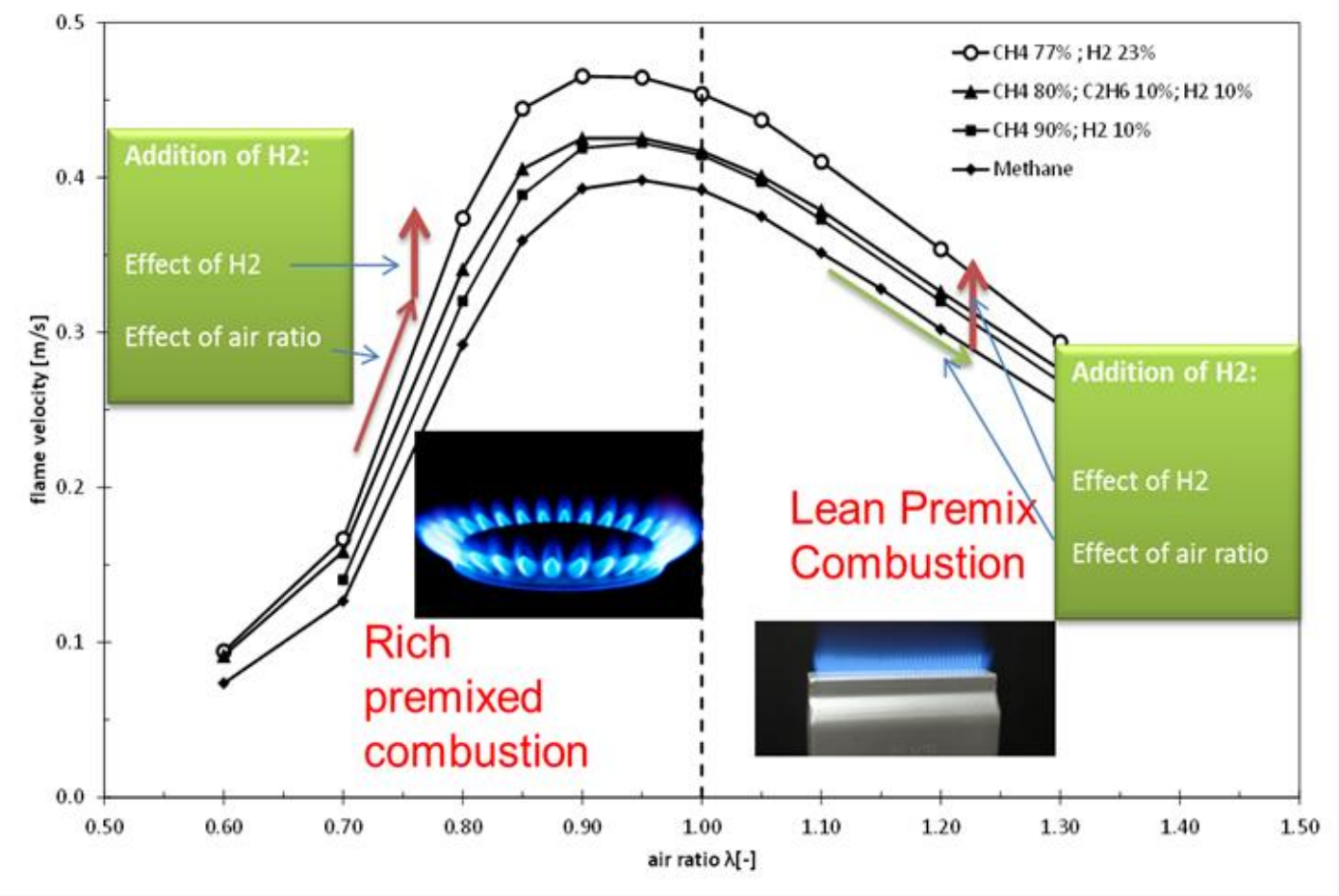


LNG



Red area: CBP natural gas specification limits as reference

Effect on gas velocity of mixtures



Source: K. Altfeld & D. Pinchbeck (GERG),

Admissible Hydrogen Concentrations in Natural Gas Systems (HIPS The paper), 2013.

What is already known

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Many gas applications are able to handle mixtures of natural gas and hydrogen without significant problems

Research has demonstrate that many residential and commercial appliances can handle up to 30 % hydrogen without safety concerns

Industrial application could handle up to 50 % hydrogen without negative impact if proper measurement and control technologies are applied

Gas turbines and gas engines are probably the most sensitive applications

- *Manufacturers and researchers are investigating new technologies to address this*

Conclusions

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Hydrogen reduces Wobbe index and calorific value of natural gas when mixed with it

- *Reduction depends on natural gas composition*
- *Not only WI/GCV is affected*

Acceptable concentrations of hydrogen are different today for different end uses

Many consequences of hydrogen admixtures are qualitatively rather similar to gas natural fluctuations

Thank you !

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TECHNICAL ASSOCIATION
OF THE EUROPEAN NATURAL GAS INDUSTRY
Avenue Palmerston 4
1000 Brussels
BELGIUM
T:+32 2 237 11 39
www.marcogaz.org