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# Evolution of H2 readiness of the Snam gas infrastructure

December 2021

# Suitability of the pipeline network for hydrogen transport

The only internationally recognized standard for the transport of hydrogen in pipelines is ASME B31.12, providing design rules for new pipelines, as well as criteria for converting pipelines originally designed for other fluids.

No dedicated European standard is available at the moment either for the design of high pressure/high capacity hydrogen pipelines or for the conversion of existing pipelines to hydrogen transport



## New pipelines

- Update of Snam Design Standards for pipelines with NG/H2 mixtures with H2 up to 100% in accordance to the ASME B31.12
- Pipeline supply to be used for new projects 100% H2 ready (certified according to ASME standards)
- Plug valve and ball valve tested with high pressure helium with positive results.

## Conversion of existing pipelines

- 32.693 km of pipelines verified - 99% ready to transport 100% H2, in accordance to the ASME B31.12 standard
- 70% of the pipelines with no or limited MOP reduction
- Future revisions of the technical standards are expected to overcome limitations

## Setting standards for H2 transport



First example of network H2 readiness certification as per ASME B31.12

**H2GAR**  
*H2 Gas Assets  
Readiness*

Cooperation with other European TSOs to share test results, analysis, studies

**Collaborations  
with Universities  
and Institutions**

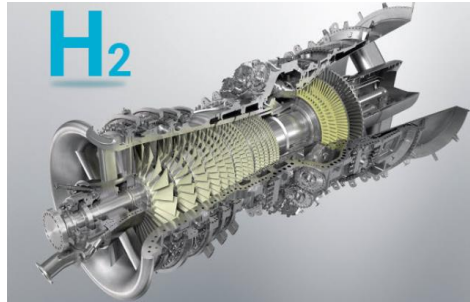
Collaboration with Fire Department and Universities to develop technical standards for transport



# Compressor Stations



## GAS TURBINES



- For H2 up to 5% by volume no hardware modifications. In principle, the suppliers have extended the limit up to 10% of hydrogen in the H2NG fuel blend.
- Above 10% of H2, hardware and software changes are required, while for H2 higher than 20% it is necessary to purchase specific machines.
- SNAM has performed Factory test on new Turbines and is planning field tests on existing Turbines for appropriate verifications and validations.

## COMPRESSORS



- Neither performance nor integrity problems for percentages of H2 by volume  $\leq 5\%$  (conservative limit).
- With the exception of some specific operating points, to be verified one by one, the value can be extended approximately up to 10%.
- Above 10% and generally up to 20% of H2, it is necessary to rebundle the compressor. Above 20% it is necessary to replace the machine.

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**2020:** Testing of the new turbine (BH Nova LT 12) up to 10% by volume of H2 in Natural Gas: Efficiency and NOx emissions are met.



# Underground storage

## Test Results

### Mineralogical Analysis

Exposure of reservoir & cap-rock samples to gas mixture with increasing H<sub>2</sub> blend

» ✓ No risk of dissolution / alteration of reservoir & cap rock minerals in **100% H<sub>2</sub> environment**

### Diffusivity Tests

Gas diffusion measurements for cap rock samples representative of Stogit fields

» ✓ Confirmed gas-tightness of reservoir for blends **up to 100% H<sub>2</sub>**

### Microbiological Analysis

Microbiological reservoir characterization based on bio-chemical kinetics

» ✓ No risk of H<sub>2</sub>S production or methanation in the reservoirs by microbial activity

### Test on Well Specimens

Testing on wells material

» ✓ No impact on cements **up to 100% H<sub>2</sub>** and to elastomeric up to 20% H<sub>2</sub>\*

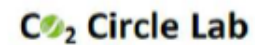
## Tests with multi-reactor

Ongoing tests in a reactor on microbiological activity with **up to 50% H<sub>2</sub> blending** (up to 100% in 2022) at reservoir pressure & temperature conditions



### Pilot test

Development of a pilot test in Snam storage sites to confirm test results in the long-term behavior



Tests confirm it is possible to store H<sub>2</sub> in our natural gas depleted fields

\* Ongoing test on 100% H<sub>2</sub>



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