H_2 Initiative
Results from the H_2 (10%) Readiness Study

CS Eggendorf / CS Weitendorf / TAG Loop II

Regulatory framework

- Efforts to achieve a low-carbon economy are major challenges that also require adaptations in the energy systems. In order to enable a rapid and efficient change and to be able to contribute to the European and Austrian climate and energy strategy, a regulatory framework for natural gas networks was developed to enable network operators to be able to contribute to the energy transition (Chapter VI of the method in accordance with Section 82 GWG 2011 of the 4th period for the transmission system of TAG GmbH).
- Projects under this frame-work are subject to the following criteria

  - ✓ The project has a direct impact on the transmission network, equipment or operation.
  - ✓ The project reduces CO2 emissions.
  - ✓ The project is innovative in terms of the technologies conventionally used by the transmission system operator.
  - ✓ The project is committed to sustainability.
  - ✓ The project has the potential for net benefits for grid users, but also for other stakeholders, or the environment in terms of an assessment in terms of national, regional and Pan-European welfare or a contribution to the general achievement of CO2 reduction or the use of energy from renewable sources in the broader sense.
  - ✓ The project increases efficiency.

Motivation for the H_2 readiness study

- For TAG as the operator of the Transmission Pipeline System between Baumgarten and Arnoldstein, the possibility of transporting hydrogen is a central question and therefore, TAG sees it as its duty to actively participate in the Energy Transition and to enable transport possibilities for Hydrogen in the future.

- Therefore, under the regulatory framework and in alignment with the Austrian regulator E-Control it was decided to conduct a H2 (10%) Readiness Study, which design and results are shown on the following pages.

Target of the H_2 readiness study

- The aim of the H2 readiness study in general was to check the suitability of the existing pipeline system for transporting H_2 in three operating states in a mixture with natural gas with a concentration of 10% H_2.

- The investigation covers the compressor stations (CS) Eggendorf and Weitendorf, and the pipeline TAG Loop II.

- The study provides an overview of the upgrading measures to be implemented as a basis for planning of further steps in TAG's H2 initiative.

Methodology of the H_2 readiness study

- In the present study, the individual systems, components, and installations (all together devices) of the existing facilities were examined from a material and function point of view for their suitability for transporting a Natural Gas-Hydrogen mixture with 10% Hydrogen concentration.
  The following definitions are thereby used for material and function:
  - Material is the sum of all material properties from which a technical device is made of, and the precisely defined requirements have to be met.
  - Function is the task that a technical device must perform accordingly to its definition (e.g. a ball valve is suitable for interrupting a gas flow).
- This review is carried out from the perspective of the physical, chemical and design suitability.
- From a structural point of view, this study was carried out related to the asset classes used in TAG
- Currently the system was not evaluated concerning its operational and maintenance conditions

Main outcomes and related consequences

- The results of the study on category level of the used asset structure are compiled together with recommendations on how the corresponding suitability can be achieved.
- In order to provide an initial quick overview, the outcomes were indicatively summarized in a table related to categories (Asset classes) and respective symbols which represent each a certain processing strategy.

Status	Color	Measure
Suitable	**Green**	"*Nothing to do*"
Partially suitable	**Yellow**	"*Retrofitting measures required*"
Unsuitable	**Red**	"*Replacement required* "

- Since the evaluation is carried out according to two criteria (Material & Function), the measure derived from it always represents the strongest and safest (e.g. "suitable" and "partially suitable" results in "upgrading measure required").

Main outcomes and related consequences

Asset Class		Material	Function	Measure
Compressor	Turbo compressors (incl. gas turbines)			fuel gas components, gas & flame detection, valves, gas chromatograph
	Electrical compressor			compressor rotor and auxuliaries probably totally or partially replaced
Metering	USMs			to be recalibrated
	Orifice metering			to be recalibrated
Piping	Piping and fittings			nothing to do
	Flanges			nothing to do
	Sealing gaskets			nothing to do
	Pig Traps			gaskets to be replaced
Pressure Equipment	Filter Separators & Internals			nothing to do
	Coolers			nothing to do
Safety	Fire & Gas detection system	n.a		Detectors to be replaced
Valves	Ball valves (without gaskets and O'Ring)			nothing to do
	Ball valves (gaskets and O'Ring)			replacement of whole valve on demand during maintenance
	Control Valves			recalibration of actuators
	Safety Valves			nothing to do
	Lubricants			nothing to do