
 Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile			CONTRACT TERIN/2021/265	UNIT WP1-LA1
	SITE CASACCIA (RM)	30-PK-01		
	PROJECT Studio di prefattibilità propedeutico all'analisi di fattibilità tecnico-economica per la Hydrogen Demo Valley Casaccia	Page 1 of 7		Rev. 1



Ref. T.EN: 203998C-001-SP-4100-300001

Hydrogen Demo Valley Pre-Feasibility Study

Duty Specification for H2-NG Mixing Package

30-PK-01



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1. INTRODUCTION

ENEA, the Italian National Agency for New Technologies, Energy and Sustainable Economic Development, has planned the realization of a Hydrogen Demo Valley (HdV) inside the research facility located at "La Casaccia", in the municipality of Rome (Italy). Such infrastructure will act as an incubator of technologies and services related to the entire hydrogen value chain, and is expected to be completed in May 2024.

T.EN Italy Solutions SpA has been awarded the preparation of a pre-feasibility study aimed at defining the scope and the execution model for the subsequent design phase and construction activity.

2. PROCESS DESCRIPTION

This duty specification defines the supply of a H₂-NG mixing packaged unit, which will produce a blend of natural gas and hydrogen, at adjustable composition, to be distributed to the various users foreseen in the project. The package shall also implement pressure control, gas metering and provisions for gas quality check.

3. FLUID SPECIFICATIONS

- | | | |
|----|---|--|
| a) | Inlet flowrate | 700 Nm ³ /h of natural gas |
| b) | Inlet pressure (op./des.) | 12 / 24 barg (natural gas), 20 / 24 barg (H ₂) |
| c) | Inlet temperature (op./des.) | 15 / 60°C (natural gas), 40 / 60°C (H ₂) |
| d) | Outlet pressure (op., des.) | 5÷11 barg adjustable set (12 barg design) |
| e) | H ₂ % in the outlet mixture | 0 ÷ 30 (%vol.), adjustable set |
| f) | Hydrogen purity | > 99% |
| g) | Natural gas composition (see table below). Natural gas composition is compliant with Italian decree of May 18 2018 and subsequent amendments and additions. | |

Component	Average (mol. %)
CH ₄ – Methane	90.224
C ₂ H ₆ – Ethane	6.065



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CASACCIA (RM)

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PROJECT

Studio di prefattibilità propedeutico all'analisi di
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Component	Average (mol. %)
C ₃ H ₈ – Propane	1.050
C ₄ H ₁₀ – i-Butane	0.111
C ₄ H ₁₀ – n-Butane	0.154
C ₅ H ₁₂ – i-Pentane	0.035
C ₅ H ₁₂ – n-Pentane	0.027
Hexane +	0.018
CO ₂ – Carbon Dioxide	1,021
N ₂ – Nitrogen	1.263
He – Helium	0.034
H ₂ – Hydrogen	0.000
O ₂ – Oxygen	0.000
Co – Carbon Monoxide	0.000
H ₂ S - Hydrogen Sulfide	≤ 5 mg/Sm ³
S as Mercaptans (*)	≤ 5 mg/Sm ³
Total Sulfur (*)	≤ 20 mg/Sm ³

(*) Excluding odorizing sulfur.

h) Natural gas properties (see table below)

Property	Average
M.W.	17.779
S.G.	0.614
HHV (25/0 °C)	11.551 (kWh/Nm ³)
W.I. (25/0 °C)	14.747 (kWh/Nm ³)

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Property	Average
LHV (25/0 °C)	10.434 (kWh/Nm3)

4. UTILITY SPECIFICATIONS



Electric power

- | | |
|-------------------|--------------------|
| a) Medium voltage | 8,4 kV |
| b) Low voltage | 400 V, 50 Hz, 3 Ph |
| | 230 V, 50 Hz, 1 Ph |
| c) UPS | will follow |

Potable Water

- | | |
|-------------|-----------------|
| a) Source | Tap water |
| b) Pressure | 2,5 barg (TBC) |
| c) Quality | see table below |

pH	–	6,80
Conductivity a 20°C	μS/cm2	262
Kubel oxidation number (as O ₂)	mg/l	<1,0
Arsenic - As	μg/l	6,4
Disinfectant (residue)	mg/l	0,08
Iron - Fe	μg/l	21,2
Nitrites (as NO ₂)	mg/l	< 0,1
Sulfates	mg/l	24,7
Ammonium (as NH ₄ ⁺)	mg/l	< 0,1
Total hardness	F°	9,2
Dry residue at 180°C	mg/l	292,6

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Nitrogen

will be supplied by ENEA

Instrument air

will be supplied by ENEA



5. SITE AND CLIMATIC DATA (MONTHLY AVERAGE)

- Ambient temperature (min/max) 4°C / 29°C
- Max humidity (at min/max temp.) 77% / 65%
- Wind speed (max) 16 km/h
- Rain (max) 132 mm
- Altitude above sea level 150 m

6. SCOPE OF SUPPLY

The package shall include (but not necessarily be limited to) the following main parts:

- A main facility which will mix natural gas and hydrogen in controlled conditions, producing a blend with variable % of H₂.
- Gas filters, if necessary
- Devices for pressure controlling, metering and quality monitoring of gases.
- Provisions for sampling the mixed gas.
- A unit control cabinet, equipped with a PLC (SIL-3) for the local control and supervision of electrical and thermal parameters. The control system shall be equipped with local/remote switch suitable for remoted start/stop and communicating facilities for interfacing with the SCADA in the main control room (room with open industry standard protocols (such as OPS, modbus, DNP3, etc).
- The supply shall include everything necessary for a safe and correct operation of the unit.
- All the equipment constituting the blending package shall be placed in one container. The container shall be suitable for outdoor installation with a required degree of protection IP 55. Alternatively, the plant can be installed on outdoor skids (Supplier to advise).

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- Provisions for F&G detection and fire-fighting.
- Compliance with PED, ATEX and Italian legislation.

7. REQUESTED INFORMATION

Supplier shall submit a technical and commercial proposal to include:

- Process Flow Diagram
- List of signals to be sent from the PLC to monitor the operation
- Dimensions and weight
- Maintenance requirements with expected Opex
- Schedule for design, construction and delivery of the unit
- Budgetary offer for purchase, lease or right to use.
- Reference list.
- Commissioning times and costs.
- Battery limits summary.