
 Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile			CONTRACT TERIN/2021/265	UNIT WP1-LA1
	SITE CASACCIA (RM)	40-PK-01		
	PROJECT Studio di prefattibilità propedeutico all'analisi di fattibilità tecnico-economica per la Hydrogen Demo Valley Casaccia	Page 1 of 6		Rev. 1



Ref. T.EN: 203998C-001-SP-4100-400001

Hydrogen Demo Valley Pre-Feasibility Study

Duty Specification for Hydrogen Refueling Station (HRS) Package

40-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 an Hydrogen Refueling Station (HRS), which will be able to inject pure H₂ at various pressures to a variety of vehicles, such as Fuel Cell Electric Vehicles (FCEV) Fuel Cell Electric Buses (FCB), minibus, forklifts, etc.

Hydrogen, provided by the dedicated hydrogen network, shall be compressed and stored in two storage units at different pressures (450 and 900 barg), suitable to ensure operating flexibility in respect to hydrogen production variability and specific refueling pressure requirements (typically, 350 and 700 barg) of the various users (vehicles). A hydrogen dispenser unit shall be provided (single or independent 350/700 barg) equipped with all necessary auxiliary units for safe refueling (e.g. communication with FC vehicles, gas pre-cooling, instrumentation etc.).

Composition of hydrogen supplied to the HRS may not always be compliant with SAE standard J2719:2020_03 “Hydrogen Fuel Quality for Fuel Cell Vehicles”, due to different hydrogen sources feeding the hydrogen network. Supplier shall provide a guard bed system to ensure FCEV-grade hydrogen at the dispenser.

3. PACKAGE SPECIFICATIONS

- | | |
|---------------------------------------|--|
| a) Maximum station capability | 50 kg of H ₂ /day |
| b) Refueling H ₂ pressure | 350 barg/700 barg |
| c) Inlet H ₂ pressure/temp | 12÷21.5 barg (des. 24 barg) / 40°C (des. 60°C) |
| d) Inlet H ₂ purity | > 99% |

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- | | |
|--------------------------------------|---|
| e) Inlet H ₂ composition | will follow |
| f) Delivered H ₂ purity | ≥ 99,999%, as per SAE standard J2719 ¹ |
| g) Total storage volume | 240 kg of H ₂ (Supplier to advise) |
| h) Storage volume @ 450 and 900 barg | Supplier to advise |
| i) HRS service factor | 240 days/year (working days) |

4. UTILITIES SPECIFICATION

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

¹ "Hydrogen Fuel Quality for Fuel Cell Vehicles" J2719:2020_03

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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:

- Inlet gas pretreatment (guard beds) to reach FCEV grade purity.
- Hydrogen compression unit(s) (dry type).
- Devices for controlling flow/pressure/temperature of hydrogen delivered to end users (such as liquid nitrogen cooling systems), including communication with the FC vehicles, ensuring a correct and stable refueling operation.
- Electrical grid connection for components (compressor, dispenser, etc.) and auxiliaries.
- Supplier to provide either a high (900 bar) and low (450 bar) pressure storage units, or a low pressure storage (450 bar) unit equipped with a booster compressor for high pressure refueling. In case of two storage units are provided (450 and 900 barg), each section shall be managed independently to deliver H2 to the dispenser.
- A unit control cabinet, equipped with a PLC (SIL-3) for the local control and supervision of process parameters. The control system shall be equipped with local/remote switch suitable for remoted start/stop, modulation and communicating facilities for interfacing with the SCADA

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in the main control room with open industry standard protocols (such as OPS, modbus, DNP3, etc).

- Cooling/Chilled Water Unit, including H₂ pre-cooling before refueling (if applicable).
- The supply must however include everything necessary for a safe and correct operation of the unit.
- All the equipment (compressors and storage) of the HRS package shall be placed in one or more containers, following all applicable Rules Codes and Standards in terms of distancing and safety measures. Each 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).
- 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
- Electric power, water consumptions
- Typical performance guarantees
- Effluents and emissions
- 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.
- Battery limits summary.