


 Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile			CONTRACT TERIN/2021/265	UNIT WP1-LA1
	SITE CASACCIA (RM)	20-PK-03		
	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-4100-200003

Hydrogen Demo Valley Pre-Feasibility Study

Duty Specification for Hydrogen Storage System 20-PK-03



1	07/04/2022	FINAL ISSUE	V. DELLA VECCHIA	A. LECCESE	P.F. PEPPOLONI
0	17/02/2022	FINAL ISSUE	V. DELLA VECCHIA	A. LECCESE	P.F. PEPPOLONI
0A	03/02/2022	ISSUE FOR REVIEW	V. DELLA VECCHIA	A. LECCESE	P.F. PEPPOLONI
REV.	DATE	DESCRIPTION	PREPARED	VERIFIED	APPROVED

 Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile		CONTRACT TERIN/2021/265	UNIT WP1-LA1
	SITE CASACCIA (RM)	20-PK-03	
	PROJECT Studio di prefattibilità propedeutico all'analisi di fattibilità tecnico-economica per la Hydrogen Demo Valley Casaccia	Page 2 of 6	Rev. 1

Ref. T.EN: 203998C-001-SP-4100-200003

Contents

1. INTRODUCTION	3
2. PROCESS DESCRIPTION	3
3. PACKAGE SPECIFICATION	3
4. UTILITIES SPECIFICATION	4
5. SITE AND CLIMATIC DATA (MONTHLY AVERAGE)	5
6. SCOPE OF SUPPLY	5
7. REQUESTED INFORMATION.....	6

 Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile			CONTRACT TERIN/2021/265	UNIT WP1-LA1
	SITE CASACCIA (RM)		20-PK-03	
	PROJECT Studio di prefattibilità propedeutico all'analisi di fattibilità tecnico-economica per la Hydrogen Demo Valley Casaccia		Page 3 of 6	Rev. 1

Ref. T.EN: 203998C-001-SP-4100-200003

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 Storage System, consisting of a hydrogen compression unit, a dedicated 200 barg storage unit and a pressure reduction system. The Hydrogen Storage System will ensure reserve capacity and flexibility to the hydrogen network, which operates at 24 barg. Hydrogen will be produced on site by means of different processes and technologies, and transported to various user by a dedicated network.

Two operating modes are anticipated: 200 barg storage filling via compression from the 24 barg network, and pressure reduction and hydrogen injection from the 200 barg storage to the network at 24 barg.

3. PACKAGE SPECIFICATION

- | | |
|------------------------------------|--|
| a) Hydrogen pressure (op./des.) | 12 barg min, 20 norm / 24 barg (design) |
| b) Hydrogen temperature (op./des.) | 40°C / 60°C |
| c) H ₂ purity | > 99% |
| d) Compressor type | reciprocating, dry type, manufacturer std |
| e) Compressor flow | 40 Nm ³ /h |
| f) Storage working volume | 30 ÷ 40 m ³ |
| g) Storage pressure (op./des.) | 200 barg max / 220 barg (Supplier to advise) |
| h) Storage type | cylinders assembled in racks |

 Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile			CONTRACT TERIN/2021/265	UNIT WP1-LA1
	SITE CASACCIA (RM)		20-PK-03	
	PROJECT Studio di prefattibilità propedeutico all'analisi di fattibilità tecnico-economica per la Hydrogen Demo Valley Casaccia		Page 4 of 6	Rev. 1

Ref. T.EN: 203998C-001-SP-4100-200003

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
Dry residue at 180°C	mg/l	292,6

Nitrogen

will be supplied by ENEA.

Instrument air

will be supplied by ENEA.

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	SITE CASACCIA (RM)	20-PK-03	
	PROJECT Studio di prefattibilità propedeutico all'analisi di fattibilità tecnico-economica per la Hydrogen Demo Valley Casaccia	Page 5 of 6	Rev. 1

Ref. T.EN: 203998C-001-SP-4100-200003

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

Supplier is expected to propose the entire Hydrogen Storage System; if not, a separate proposal for either compression unit only or storage and delivery only is acceptable.

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

- Hydrogen compression unit (reciprocating, dry type, manufacturer standard), equipped with gas filters, pulsation dampers, gas separators and coolers, and capacity control system.
- Hydrogen storage unit, composed of gas cylinders arranged in racks, independently fillable.
- Hydrogen delivery unit.
- 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 and communicating facilities for interfacing with the SCADA in the main control room with open industry standard protocols (such as OPS, modbus, DNP3, etc).
- Cooling/Chilled Water Unit (if necessary).
- Water demineralization Unit (if necessary).
- The supply must however include everything necessary for a safe and correct operation of the unit (relief valves, pressure gauges).
- All equipment of the package shall be placed in one or more containers. 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.

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	SITE CASACCIA (RM)	20-PK-03	
	PROJECT Studio di prefattibilità propedeutico all'analisi di fattibilità tecnico-economica per la Hydrogen Demo Valley Casaccia	Page 6 of 6	Rev. 1

Ref. T.EN: 203998C-001-SP-4100-200003

7. REQUESTED INFORMATION

Supplier shall submit a technical and commercial proposal to include:

- Process Flow Diagram
- Utility consumptions
- 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.
- Site technical service
- Reference list
- Delivery times
- Commissioning times and costs
- Battery limits summary.