
 Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile			<b>CONTRACT</b> TERIN/2021/265	<b>UNIT</b> WP1-LA1
	<b>SITE</b> CASACCIA (RM)	<b>50-PK-03</b>		
	<b>PROJECT</b> Studio di prefattibilità propedeutico all'analisi di fattibilità tecnico-economica per la Hydrogen Demo Valley Casaccia	Page 1 of 6		<b>Rev.</b> 3



Ref. T.EN: 203998C-001-SP-4100-500003

## Hydrogen Demo Valley Pre-Feasibility Study

### Duty Specification for PEM Fuel Cell Package

**50-PK-03**



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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 concerns the supply of a Cogenerative PEMFC (Polymer Electrolyte Membrane Fuel Cell) Packaged unit for the production of electricity and thermal energy. ENEA is evaluating the possibility (Option 1) to use the PEMFC as heat source to produce hot water (ranging from 75°C to 90°C; heat duty is 50,2 kW) circulating through an external water-fired absorption chiller (NOT to be included in this scope of supply); Supplier is requested to confirm this arrangement. Alternatively (Option 2), the PEMFC electrical output shall be limited to 10 kWe.

The Fuel Cell Package will use hydrogen with purity according to SAE J2719.

Supplier shall indicate the operating envelope and corresponding fuel cell performances. The PEMFC Package will be operating continuously throughout the year.

## 3. FUEL CELL SPECIFICATION



### Main characteristics:

#### a) Thermal and Electrical output:

- Option 1: Thermal output (requested) 50 ÷ 55 kW
- Option 2: Electrical output (requested) 10 kWe

b) Electrical efficiency 40% (Supplier to advise)

c) Overall efficiency 80% (Supplier to advise)

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d) Service Factor

>8000 hrs / year

#### 4. FUEL GAS SPECIFICATION

- a) Inlet pressure (op./des.) 20/24 barg
- b) Inlet temperature (op./des.) 40/60°C
- c) Purity according to SAE J2719

#### 5. 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 <sub>2</sub> )	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 <sub>2</sub> )	mg/l	< 0,1
Sulfates	mg/l	24,7
Ammonium (as NH <sub>4</sub> <sup>+</sup> )	mg/l	< 0,1
Total hardness	F°	9,2

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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



## 6. 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

## 7. SCOPE OF SUPPLY

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

- One or more PEM Fuel Cell Stacks
- Inverter (Power conditioning) and inverter cooling system
- Emergency Cooling System (if necessary) which dissipates heat and ensures the cooling of the Fuel Cell even in the event of a sudden drop in heat demand from the user
- Water Treatment System (if necessary)
- Heat recovery circuit and Cooling/Chilled Water Unit (if necessary)
- 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, load modulation and communicating facilities for interfacing with the SCADA in the main control room with open industry standard protocols (such as OPC, modbus, DNP3, etc).

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- The supply must however include everything necessary for a safe and correct operation of the unit.
- All the equipment constituting the Fuel Cell 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
- Provisions for F&G detection and fire-fighting and inside the container.
- Compliance with PED, ATEX and Italian legislation.

## 8. REQUESTED INFORMATION

Supplier shall submit a technical and commercial proposal to include:

- Process Flow Diagram and Heat & Material Balance
- Electric and thermal output and efficiency vs. load rangeability
- Hydrogen, air, utilities and chemicals consumptions
- Water consumption (if any)
- Exhaust gas (temperature, flow rate and composition)
- Effluents and emissions
- Dynamic behaviour
- List of signals to be sent from the PLC to monitor the operation
- Dimensions and weight
- Reference List
- Expected lifetime, degradation vs. operation mode
- Maintenance requirements with expected Opex
- Schedule for design, construction and delivery of the unit
- Budgetary offer for purchase, lease or right to use.
- Typical performance guarantees.
- Battery limits summary.