**TECHNICAL ANNEX FOR A SOLAR FIELD TEST STATION TO BE INSTALLED ON THE ROOF OF THE TESTING CENTER OF CNR-ITAE IN MESSINA (ITALY)**

The system for which this tender is instructed must consist of i) a test stand prepared for the future installation of a two axes tracker (which keeps test samples perpendicular to the sun) and ii) a test facility for performance testing of solar collectors (the test of solar thermal systems is not required in the base configuration). The test stand must be designed for outdoor testing of more than one collector at the same time to allow direct comparison of different collector designs under same conditions (minimum requirement: 2 collectors). If necessary, CNR-ITAE can grant the provision of cold water at 10 °C to serve the testing equipment, by means of a 58 kW electric-compression chiller already available on site. The maximum admitted load on the roof floor is 450 kg/m2. The test facility minimum requirements, which must be fulfilled under penalty of exclusion of the offer, are the following:

* **Testing capacity:** the test stand must have the capacity to test two solar thermal collectors in parallel (ISO 9806:2017 method quasi dynamic; the proposed system must be ready for the installation of a tracking device and to be upgraded on steady state method);
* **Upgradable:** Possibility to upgrade the system for the test of storages and solar thermal systems;
* **Hydraulics:** the minimum hydraulic equipment must include the devices as reported in Table 1

**Table 1. Hydraulics**

|  |  |  |  |
| --- | --- | --- | --- |
| N | Pcs. | Description | Min. required accuracy |
| 1 | 2 | Pumps for setting of mass flow | Volume flow stability: ± 1 % |
| 2 | 2 | Frequency controller for the pumps |  |
| 3 | 2 | Water temperature control unit | Temperature stability: ± 1 K |
| 4 | 2 | Ventilation units |  |
| 5 | n.a. | Flexible hoses to connect the collectors under test |  |
| 6 | n.a. | Piping, valves and safety components |  |

* **Sensors:** the minimum sensors equipment must include the devices as reported in Table 2

**Table 2. Sensors**

|  |  |  |  |
| --- | --- | --- | --- |
| N | Pcs. | Description | Min. required accuracy |
| 1 | 6 | PT100 sensors for collector circuit temperature measurement | class 1/3B, pairwise calibrated |
| 2 | 2 | PT100 sensors – ventilated for ambient air temperature measurement |  |
| 3 | 2 | Pyranometer (one with shadow ring ) | secondary standard (acc. ISO 9060) |
| 4 | 2 | Electromagnetic flow meter | Standard deviation <1 % |
| 5 | 1 | Wind speed sensor | Measurement range 0.5 – 30 m/s; |
| 6 | 1 | Data acquisition hardware with Ethernet interface (TCP/IP) |  |
| 7 | 1 | Data acquisition software and control software |  |
| 8 | 1 | Computer |  |

* **Test facility:** the entire equipment which is listed above must be installed in a container which easily transportable. The container will comprise all the necessary equipment and components, which must be installed indoor and used for the temperature and flow rate management of the testing stand. A plug-in solution should be provided. A heating and cooling system installed in the container is not required as part of the basic configuration: if necessary, CNR-ITAE will care about the installation of an air conditioning system.
* **Software:** test stand and facility have to be offered with a control software with a graphical user interface. The user interface should be easy and guide the user through the tests in conformity with ISO 17025.
* **Warranty:** a minimum warranty period of 12 months is required. Warranty must include maintenance and support, one heavy maintenance to be carried out after one year and technical assistance via phone and E-Mail.

**FINAL REMARKS:** The proposed systems must be ready for future upgrades, both software and hardware.

Offer has to include the following additional items:

1. Electrical work;
2. Hydraulic work;
3. Shipping;
4. Installation and training: this item has to include travel and accommodation costs for company employees on site. ITAE will care to prepare the installation site and will grant access to the installation site from Monday to Saturday between 8:00 am and 8:00 pm. A time-frame of 1 (ONE) week is estimated for the complete installation of the system.

**The evaluation of the offers will be carried out on a technical and economic basis, with different weights: a maximum score of 40+40 points will be assigned for the quality of the technical offer and a maximum score of 20 points for the economic offer.**

**The technical score will be established by evaluating the technical quality of the base configuration (40 points) and the extra features offered over the base configuration, according to Table 3 (maximum 40 points).**

**THE AVAILABLE BUDGET IS 213.000,00 € VAT 22 % INCLUDED .**

**Table 3.: The following scores will be assigned on technical basis to the offers containing additional feature over the base configuaration**

|  |  |
| --- | --- |
| **EXTRA-Feature** | **Score** |
| Possibility to perform test in compliance to EN 12975-2 / ISO 9806:2013 Method: steady state | **For 1 collector: 5 pts**  **For 2 collectors: 10 pts** |
| Water temperature control unit with an improved temperature stability | **Stability <= 0.1 °C: 5 pts**  **0.1 < Stability <= 0.5 °C : 3 pts**  **0.5 < Stability < 1 °C: 1 pts** |
| Possibility to test up to two domestic hot water heating systems acc. to ISO 9459-5:2007 Method: DST | **1 collector: 5 pts**  **2 collectors: 10 pts** |
| Pumps for setting of mass flow with an improved volume flow stability | **If better than +/- 1%: 2 pts** |
| Additional ventilation units | **If more than 2: 2 pts** |
| Cold water grid for the collector testing facility, including cold water storage and chiller | **If present: 3 pts** |
| Air conditioning unit installed in the container | **If present: 2 pts** |
| Pressure loss equipment for solar collectors to measure the pressure loss of a solar thermal collector at different flow rates. | **If present: 2 pts** |
| Warranty extension | **Up to 24 months: 1 pts**  **Up to 36 months: 2 pts** |
| Installation with the crane on the roof, for the main equipment and all options. | **If present: 2 pts** |