This specification is for the supply of a biomass gasification plant used for research on biomass combustion for energy.

This technical specification is designed to act also as a compliance statement. Suppliers should indicate whether they “Comply”, “Partially Comply” or “Do Not Comply” for each item. In the case or partial compliance, the supplier must state what aspects comply and what do not. For “Comply” and “Do Not Comply” suppliers are strongly encouraged to indicate the value. In some instances, items which do not comply for all aspects of the technical specification may still be accepted based on the overall strength of the instrument. Under no circumstances should a supplier return this form with elements deleted. Suppliers should provide all relevant brochures and technical sheets on any instrument quoted to support all claims of compliance. The technical specification sheet and all the additional information materials, consisting of brochures, manuals, guides etc. must be provided by the supplier in electronic searchable form on the CD or USB key under the risk of the offer rejection.

Critical remarks:

The instrument must fit the designated area described in the attachments Space for instrument installation and Details of Space for instrument installation. If a system offered is larger than requested, consider customisation/ miniaturization of the system. To ensure the dimension are in the range, please provide the drawings showing aperture at its location. Also, note that instrument may occupy both under and top bench spaces. Also, see attachment **Scope of work clarifications**

**Main Components**

The system should include the following components

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| The system should include the following components **Components**  | **Compliance statement**  |
| 1.  | Reactor in the form of fluidized bed (Fluidized bed is preferred but fixed bed will also be considered)  |
| 2.  | A gas handling and mixing sub-system; including N2, O2 and CO2 supply with cylinders and N2, O2 generators.  |
| 3.  | Steam generator to supply steam for gasification (Steam temperature: 100-120°C, Steam capacity: 3 kg/hr)  |
| 4.  | A heated cyclone separator or filter  |
| 5.  | Condenser capable reduce temperature of gases to 25 ⁰C, but it also should be adjustable to obtain gases with temperature 150 ⁰C and 200 ⁰C.  |
| 6.  | Product Receiver  |
| 7.  | Controller Unit – PCL type  |
| 8.  | All necessary connecting equipment  |
| 9.  | Equipment stand. (Stand that enables easiest relocation of instrument will be preferred)  |
| 10.  | Needs to enable online system monitoring and diagnosis  |
| 11.  | Steam generator (to power the turbine)  |
| 12.  | Turbine powered by steam generator (to measure power output of gasification)  |
| 13.  | Engine (to measure power output of gasification)  |
| 14.  | Min 50 kg Feedstock bin (could feed materials (size <2 mm) continuously without choking  |
| 15.  | Flue gas meter  |
| 16.  | Pressure meters located at the condenser exit  |
| **Instrument Features Feature**  | **Compliance statement**  |
| *System*  |

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| 1  | The system must be compatible with GC/MS analytical equipment, for example by using the tee connection and forward pressure regulator  |
| 2  | The process of gasification should be continuous. The system must be setup for automated drain from the product recovery vessel.  |
| 1  | Should be able to convert biomass and other waste materials into synthesis gas  |
| 2  | Reactor volume should be no less than 400 cc and no more than 5000 cc  |
| 3  | The fluidized bad reactor should be able to work in fixed bed reactor mode (via gas flow reduction) without damaging the system.  |
| 4  | Reactor should operate in temperature range 600- 1200 ⁰C  |
| 5  | Reactor detachable to enable cleaning prior to our experimental runs.  |
| 6  | Reactor must be resistant against cleaning agents and suitable for mechanical cleaning – removal of solid residues using hammer for example.  |
| 7  | A heated cyclone separator or filter must be easily detachable, and suitable for chemical and mechanical cleaning.  |
| 8  | Condenser must be easily detachable, suitable for chemical and mechanical cleaning.  |
| 9  | Flue gas meter optimized to compile with ranges highlighted at point 10  |
| 10  | Controller Unit – PCL type must enable controlling the parameters such as temperature (600-1200⁰C), heating rate (<25°C/min), solid residence time (<60 min), steam to biomass ratio (0 to 5), Equivalence ratio (<0.5), pressures.  |
| 11  | Steam generator must be equipped with steam flow meter.  |
| Physical Compatibility Requirements Parameter  | Compliance statement  |
| 1  | Combined footprint for full Fluidized Reactor System including the stand should be less than 750 mm (W) x 650 mm (D) and 650 (H) for the bench top part of the instrument and for the 650 mm (W) x 650 mm (D) and 650 (H) under bench. Supplier must provide layout sketch indicating all dimensions of units. Supplier should provide layout sketch for the mounting system. The drawings of the instrument layout should be prepared using space criteria described in attachments Space for instrument installation and Details of Space for instrument installation  |
| 2  | Total weight for the system < 100 kg /m2 of the available space as per attachment Space for instrument installation and Details of Space for instrument installation  |
| 3  | All units 220-240 V and 50 Hz power supply, G plug-type and no more than 60 A.  |
| Supply Inclusions (must be included in the main technical offer) Item  | Compliance statement  |
| 1  | Delivery, installation and commissioning (including performance verification)  |
| 2  | Onsite training (post installation)  |
| 2a  | Delivery – less than or equal to 150 days from award  |
| 3  | Warranty, minimum 3 year with  |
| 4  | Supplier engineer must agree to be involved in SOP preparation  |