

## Section 3a: Schedule of Requirements and Technical Specifications

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### A. Background

The Moldova Energy and Biomass Project, funded by the European Union and implemented by UNDP aims to contribute to a more secure, competitive and sustainable energy production in the Republic of Moldova through targeted support to the most viable and readily available local source of renewable energy, namely biomass from agricultural wastes.

During the first phase of the project implemented by UNDP Moldova through 2011-2014 were installed 141 thermal heating systems (11 more than the originally planned 130) primarily burning biomass fuel from agricultural wastes for provision of heating in schools, kindergartens and community centers.

As of December 2014, the project entered into the second phase with the main objective to scale up the successful activities from the first phase of the project and extend them to so far not covered or underrepresented regions and to support the further consolidation of the biomass market. As of the beginning of the second phase, the project contracted/installed 67 biomass heating systems and 29 Solar Installations for Domestic Hot Water.

At the current stage MEBP is expecting to identify and contract a specialized engineering/design/construction company (or a Consortium) to develop the detailed design including complete technical solution as well as delivering specialized equipment and civil works for construction of the briquetting line equipment for the municipal operator - "Public Services Cimislia" Municipal Enterprise.

### B. Objective of the assignment:

The overall objective of the assignment is to provide professional engineering and design services together with construction works for the briquetting line, including delivering the specialized equipment for the municipal operator - "Public Services Cimislia" Municipal Enterprise

### C. Design requirements:

The selected contractor will render its services for development of clear and complete designs including the following:

**Statement of Works (SOW)** with narrative descriptions of the equipment, material and systems;

**Drawings:** Complete detailed construction drawings of all works in sufficient detail and construction purposes. All drawings shall be presented in electronic (PDF and DWG) format and on appropriate paper support. All drawings should be clear, sharp, and accurate. Symbols and abbreviations should be defined in a legend. Isometric drawings shall be developed for the whole heating system (incl. piping) in cases when the design of internal heating systems will be also part of the design assignment.

**Bill of quantities (BOQ):** Complete for all items of work with adequate description for each item. The quantities for all work items should be based on actual take-off calculation and not based on estimates. All BOQs shall be presented in a spreadsheet format, preferably MS Excel;

**Specifications:** Comprehensive and up to date, in accordance with current best practices, general and particular technical Specifications for all works and equipment based on internationally accepted standards and sufficient for procurement, installation and construction works;

**Documentation** of all design literature and design calculations for all civil, structural, electrical, automation and mechanical works.

**Cost estimations:** comprehensive estimation of involved costs taking into account all necessary labor and materials based on current prices available on the local market.

The design works will include (but they will not be limited to) the following compartments:

#### **General plan**

- Geodetic surveys of the land (where appropriate) and recommendations, necessary for related works (foundation execution), installation of the briquetting line and related facilities, arrangement of the deposits for the storage of the raw material and landscaping;
- Designing the access ways to the thermal power plant and the fuel storage;
- Landscaping.

#### **Architecture compartment**

- Architectural design of the solid biofuel briquettes production line in the existing building (Annex 1 plan). The installation of the line is proposed in the area of axes 7-10 according to annex 1 but the exact place will be established in the design process.

#### **Resistance compartment**

- Designing the resistance structure of the line foundations for the production of briquettes and related facilities (bunker, chopper, etc.). At the design stage will be examined the need to demolish and / or build the needed construction elements.

#### **Ventilation compartment**

- Designing the ventilation system for biofuel production and storage rooms in accordance with building regulations and sanitary standards.

#### **Electrical network compartment**

- Designing the power supply system of all the equipment, including the low voltage system, the earth connection, the lightning protection.
- For the schematic electrical diagrams, the EC 60617 standard will be used.

#### **Electrical equipment compartment**

- The project compartment will provide for compliance with applicable local regulations, standards and standards. The power supply is 3 phases, 380V, 50Hz. All machinery and equipment will be equipped with an earthing plug.

#### **Automation compartment**

- Designing the automated system for directing the operation of the solid biofuel production equipment.

### **Fire sign compartment**

- Designing the signaling and warning system in the event of the occurrence of fire hazards and dangerous concentrations of explosive gases.

### **Environmental Protection Compartment**

- Environmental impact assessment and calculation of pollutant emissions to air as a result of the operation of the solid biofuel production line.

The documents, the Drawings and Specifications, shall be of sufficient detail to enable construction to proceed without need for on-site instructions as to material selection, construction assembly, layout or location of any element or feature.

The design should comply with the government norms, standards and specifications, and the local building regulations and shall ensure:

- reliable and safe operation of equipment, materials and systems;
- briquetting line's performance requirements;
- optimal energy efficiency of operation;
- cost efficiency in terms on construction, operation and maintenance;
- compliance with occupational health and safety requirements;
- compliance with environmental protection requirements.

Design shall provide adequate space and accessibility to installed equipment, this means ease of access, space for maintenance and repair, and access for removal and replacement of large and heavy equipment items.

The list of equipment and information about its performance should be included in the drawings as well as in the cost estimate.

Contractor shall properly coordinate the design and engineering process with the local planning authorities, beneficiary and MEBP.

Contractor should obtain for design expertise, clearance from the fire, health, environmental protection authorities.

Contractor should assist beneficiary in requesting and obtaining from the local authorities planning certificate(s).

Contractor should assist beneficiary to prepare all necessary required supporting documentations to obtain design and construction permits from local planning authority.

All the construction design documentation shall be subject to mandatory control by the authorised technical design Verifiers. Before control the Contractor has to make sure the beneficiary has no objections to the documentation. Design documentation shall undergo an examination (by experts) when needed.

At the end of the works, the Contractor will prepare and present 4 complete sets of the project documentation, of which 1 copy of the complete set of documents will be submitted to UNDP Moldova (PEBM II) and 3 copies to Cimislia City Hall.

The contractor assumes the responsibility to make the necessary technical adjustments (appeared in the process of construction) to the project documentation. These adjustments will be made within three working days upon the official request from the MEBP and/or beneficiary.

#### **D. Construction requirements:**

The construction works have to correspond exactly to the design.

Upon termination of Construction Works, the Contractor will participate in the works hand-over activities and will endorse an author confirmation certifying the compliance of Works to the design.

The beneficiary will be responsible for ensuring the building related construction works as the design will outline.

The beneficiary will ensure the power connection point (no additional connectors, protection elements, etc.) from which the contractor will install the control panel, connect all equipment and accessories.

The construction of the foundations for the equipment, including demolition works will be ensured by the Contractor.

#### **E. Technical specifications**

##### **1. Purpose of the technical specifications**

The purpose of these technical specifications is to define specific requirements for the procurement of specialized equipment and of briquette production line equipment for initiating the production of solid biomass fuel in the Cimislia district by the municipal operator - "Cimislia Public Services" Municipal Enterprise.

##### **2. Destination of equipment**

Both the specialized equipment and the briquetting line equipment are meant for initiating production of biomass solid biofuel by the municipal operator - "Cimislia Public Services" Municipal Enterprise.

The entire briquetting cycle comprises two components: the specialized equipment and the operational equipment. Both components are intended for the following stages of the briquetting cycle, namely:

- Specialized equipment for collecting, chopping and transporting raw material (wood chips);
- Operational equipment for the production of briquettes;
- Specialized equipment for briquette storage.

For the sake of clarity, the entire operational model will be presented, including the specialized equipment and the equipment required for each stage of the briquetting process:

### 1. Stage – collecting, chopping and transporting raw material

The process of collecting raw materials will be carried out after the care and sanitary works of the green areas inside the town area, the forests and the forest strips.

As a raw material for the production of briquettes, there will be used wood wastes, but they need to be chopped by a mobile shredder with semi-automatic retrieval, that is connected to the tractor and a portable shredder that is also connected to the tractor.

Then the chopped material is required to be transported to the briquetting production line, so a tractor and trailer are needed.

### 2. Stage – loading/storage

In the production of briquettes, a front loader is required to be used in order to load raw material that is already chopped (wood chips) into the primary hopper of the biofuel production line. At the same time, this loader must replace the forklift loader that has the purpose of storing the finished product. As an additional equipment, a manual forklift loader will also be needed.

At the design stage, the appropriate technical solution for loading the hopper with raw material (screw conveyor or belt conveyor) will be determined and after coordination with beneficiary will be implemented by the Contractor.

### 3. Stage – briquette production

The shredded raw material that has been loaded in the production section needs to be processed until obtaining the finished product – solid biofuels - briquettes.

For that stage, the briquette production line should be equipped with all the required equipment, as well as auxiliary one, in order to ensure that the entire briquette production process is free of interruption and is automatic as far as possible, it is also necessary to ensure that quality of the final product will not be affected and that the production capacity of minimum 450 kg/h is met.

The briquettes production line must be equipped with the following basic equipment:

- Feed hopper;
- Separator;
- Hammer mill;
- Dryer;
- Briquetting press;
- Briquette cooling line;
- Briquette packing system.

Therefore, the line has to contain auxiliary equipment for connecting the basic equipment described above, as well as the mounting elements for all the line equipment. Thus, the briquette production line with a capacity of minimum 450 kg/h has to be complete.

Based on the above description, a description of the requirements of the technical specifications was carried out in particular for the following:

- Specialized equipment;
- Operational equipment of the briquette production line with a capacity of minimum 450 kg/h.

## **3. Technical specifications of the specialized equipment**

### 3.1. Mobile shredder with semi-automatic retrieval, connected to the tractor

The collected branches need to be chopped. This requires a mobile shredder with semi-automatic retrieval.

The shredder must be suitable for tractors with a minimum of 85 hp, for the installation on the rear lift, while a trailer is towed from the front side, in which the wood chips accumulate. This shredder must be fitted with an automatic system for transporting the shredded material to the trailer.

This shredder is required to consist of a massive rotor, which will allow the branches to be cut up to 80 mm, turning it into shredded material, that is thrown by a ventilated conveyor into the trailer.

**Technical characteristics** of the mobile shredder with semi-automatic retrieval:

- Capacity – the minimum amount must be correlated with the daily need of the production line - at least 4-6 tones of chips per day;
- Cutting diameter: 0 - 80 mm;
- Cutting size: width up to 15 mm and length up to 20 mm;
- Required power of the tractor: less than 85 hp;
- Length of the ventilated material transporter: 6 - 8 m;
- Connectivity: Front and rear tractor lift;
- Driving mechanism: tractor axle;
- Transmission type: chain;
- Working width: at least 1800 mm;
- Metallic chassis with a minimum thickness of 10 mm;
- Tubular rotor with a minimum diameter of 420 mm;
- Protection: visibility for personnel, frontal protection;
- Model built according to EC regulations regarding this field of work;
- Equipped with a hydraulic system and oil cooler.

### **3.2. Portable shredder attached to the tractor**

The branch shredder is to be used for shredding branches and other wood material, which is to be attached to the tractor's axle. This is a spare equipment intended for maintenance work for green areas in town. The branch shredder must allow a trailer to be attached simultaneously to the rear hook of the tractor, so that the branch chopping material can be inserted through the lateral side, and the sawdust discharged through the back of the machine into the trailer.

Technical characteristics of the portable shredder:

- Chopping capacity: minimum 3,5 m<sup>3</sup>/h;
- Required power of the tractor: less than 40 hp;
- Hoist height: 3 -4 m;
- Maximum diameter of chopped material: maximum 180 mm;
- Wood chips size: 30-50 mm;

- Equipped with an exhaust tube with the possibility of adjusting the height;
- Driving mechanism: tractor axle;
- Possibility to attach to the tractor and to attach the trailer in the same time.

### **3.3. Front loader/forklift**

For continuous and uniform feeding of raw material (shredded wood), for the feed hopper of the briquettes production line, **a front loader** will be used. At the same time, this loader must also **be equipped with a forklifting mechanism** used for storing the final production of briquettes.

#### **Technical characteristics for front loader:**

- Lifting capacity: at least 700 kg;
- Lifting height: at least 2,8 m.
- Shovel width: at least 1,6 m;
- Shovel load volume: at least 0,45 m<sup>3</sup>;

#### **Technical characteristics for the forklifting mechanism:**

- Lifting capacity: at least 1500 kg;
- Lifting height: 4 – 5 m.

### **3.4. Manual pallet jack**

If the front loader/forklift is loaded with sawdust, storage will be conducted using the hand pallet truck.

#### **Technical characteristics of the hand pallet:**

- Lifting capacity: at least 1500 kg.

## **4. Technical specifications of the briquetting line equipment**

The integrated production line for wood waste briquetting that is to be installed on the territory of the Municipal Enterprise "Cimislia Public Services" must meet the following criteria:

- Production line specialization: hexagonal pini kay briquettes;
- Briquette size: diameter 50 mm, length approximately 300 mm;
- Type of raw material: wood waste;
- Production capacity: nominal capacity minimum 450 kg/h;
- Scheduled activity: at least 8 h/day without interruption;
- Operating days per year: minimum 250 business days;
- Operating hours per year: at least 1 984 h/year;
- Production line life: at least 20 years.

#### **4.1. Feed hopper**

The feed hopper serves to continuously and uniformly feed the feedstock to the hammer mill. This hopper is a link element between the front loader and the hammer mill.

The hopper is loaded through the top that is open and is unloaded through the bottom. The unloading of the raw material from the feeder hopper to the hammer mill must be adjustable, continuous and uniform in order to avoid instability and disturbances of the working capacity of the entire line.

**Components** of the feed hopper:

- Control system for feedstock supply;
- Mixer for homogenizing raw material;
- Transporter for transfer to hammer mill;
- Vibrating screen for large objects;
- Efficiency class of the electric motor: at least IE2.

**Technical characteristics** of the feed hopper:

- Raw material processing capacity: minimum 450 kg/h;
- Feed hopper purpose: wood chips;
- Feed hopper height: maximum 2 m;
- Feed hopper volume: at least 2 m<sup>3</sup>;
- Approximate size of the feed part: the size will be specified at the planning stage but should ensure the possibility of feeding with the front loader with a shovel of up to 1.8 m in width.

#### **4.2. Separator**

The separator is designed to separate elements heavier than wood, by the gravity method and magnetic method, and by separating objects that are lighter than wood.

**Components** of the separator:

- Magnetic separator;
- Gravity separator.

**Technical characteristics** of the separator:

- Raw material capacity through the separator: minimum 450 kg/h.



### **5.3. Hammer mill**

The hammer mill reduces the material obtained by cutting wood waste.

Basic **components**:

- Complete control panel including overload control.
- Feed conveyor and fan for aspirating the chopped material that is thrown to the drier;
- Efficiency class of the electric motor: at least IE2.

**Technical characteristics** for hammer mill:

- Cutting capacity: minimum 450 kg/h;
- Input size of the raw material: 30-50 mm;
- Output size of chopped material: from 1 to 3 mm;
- Protection from sparks.

### **5.4. Aerodynamic drier in the briquetting line**

The drying system is recommended for all wood products such as shredded wood, sawdust, wood dust as well as agricultural products such as straw and other raw materials that are renewable.

In the drier, a warm air stream keeps the raw material in the air if it is dry. Due to the high airflow, the raw material is steamed in the heat exchanger (aerodynamic cyclones of the drier) and as a result of the heat exchange, the free water is eliminated.

**Components** of the drier:

- Heat exchanger and hot air generator;
- Dispenser hopper;
- Pipes and cyclones;
- Complete control panel based on the moisture content of input and output raw materials;
- Efficiency class of electric motors: at least IE2.

In the drying process, the cold air, with the aid of a heat generator, is heated and mixed with the wet raw material. The raw material is dried for a few seconds. Afterwards, the dry raw material is discharged through the fan and cyclones, and the exhaust air is vented to the atmosphere.

Minimal **technical characteristics** for the aerodynamic drier:

- Drying capacity: at least 450 kg/hour;
- Humidity of input raw materials: maximum 65%;
- Humidity of output raw materials: 8-10%;
- Protection from sparks;
- Filtering equipment;
- Pipes and cyclones made of zinc-plated sheets of 2 mm thickness.

Minimal technical characteristics for the hot air generator:

- Purpose: sawdust dryer;
- Air temperature control and control panel;
- Combustion chamber: constituted from sheets of at least 6 mm with corrosion protection and resistance to combustion temperatures;
- Air chamber constituted from sheets of at least 2 mm, with corrosion protection;
- Equipped with a heat exchanger;
- Insulation: thermal insulation material at least 100 mm/700 degree fire class A1;
- External coating: zinc plated sheet of at least 0.7 mm, electrostatic painting;
- Equipped with supply door and ash tank;
- Controlled combustion: centrifugal fan and thermostat;
- Electrical panel: temperature control, on/off fan commands;
- Equipped with analog thermometer;
- Nominal thermal output required for sawdust drying: minimum 450 kg/h with humidity up to 65%.

### **5.5. Briquetting press**

The final stage involves the operation of the briquetting machine, which turns the sawdust into briquettes, that is, it presses it to the total exhaust of the existing air between the wood chips.

Briquette manufacturing is a well-established technology. However, **in screw press** technology, the raw material is compressed with a screw through a **conical die**. Therefore, an essential aspect is the wear degree of the screw, which influences the line's operational capacity. Therefore, for these reasons, the press must be of **high quality, with a minimum lifetime of the die of 350 tones**, and of **100 tones** for the screw.

According to the analyzes of various types of screw presses, it has been shown that the production rate increases as the step of the screw increases.

**Components** of the briquetting press:

- Smoke removal system;
- Control panel for regulating engine rotation;
- Efficiency class of the electric motor: at least IE2.

**Minimal technical characteristics for the briquetting press:**

- Press type: screw press;
- Screw steel quality: impregnated AISI 1035;
- Shape of the die: hexagonal;
- Die steel quality: impregnated AISI 1035;
- Production capacity: minimum 450 kg/hour;
- Type of raw material: wood sawdust;
- Moisture of the raw material: 8-10%;
- Briquette type: pini-kay;
- Minimum density of briquettes: 1000 kg/m<sup>3</sup>;
- Dimensions of the briquettes: diameter 50 mm, length approximately 300 mm, hexagonal;
- Protection from sparks.

**5.6. Cooling system for briquettes**

Cooling after the briquetting operation is the mandatory operation in the manufacturing process due to the high temperature of the finished product at its exit from the extrusion die.

The output temperature can reach 90 - 100 °C, which results in damage to the finished product if it is still stored or packaged at this temperature. Therefore, the cooling of the briquettes takes place along the path of the briquettes exhaust duct, on which it is required to be installed a hood smoke-extractor with a fan. The length of the briquettes exhaust duct must be of such a length that at the end of the briquette, the briquette temperature is below 40 °C irrespective of the outside temperature and in the cooling crates, the briquettes will reach a temperature of about 25 °C.

**Components of the cooling system:**

- Exhaust duct for the briquettes;
- Hood smoke extractor-with fan;
- Automatic cutting system (automatic system for breaking the briquettes at a certain length);
- Cooling crates (according to the technical design) – at least 8 crates with a volume of at least 0,7 m<sup>3</sup>.

**Technical characteristics for the cooling system:**

- Production capacity: at least 450 kg/hour;

- The temperature of the briquettes at the end of the exhaust duct: below 40°C.

### **5.7. Briquette packing system**

Packaging is done semi-automatically in bags weighing 15-25 kg. The operator adjusts the electronic weighing scale to the desired weight, places the bag on the scales, and fills the bag with briquettes, already cooled to the adjusted weight, after which the bags are sealed.

**Components** of the packaging system:

- Electronic scale;
- Packaging table (according to the technical project);
- Portable bag sealant: approximately 20-30 bags/hour (according to the technical project).

**Technical characteristics** for the packing system:

- Single packing weight: 15-25 kg bag;
- Nominal bag packing capacity: at least 450 kg/hour or approximately 20-30 bags.

Other technical features will be examined at the engineering design stage.

### **5.8. General control panel**

In order for the line to operate as safe and interruption-free as possible with a high reliability for the briquettes production line in regard to all of the equipment in the briquetting process, it is necessary for the technological line to be equipped with a general control panel that has to fulfill the following functions:

- Automation of the briquetting line;
- Correlation between the equipment of the line;
- Notification regarding disruptions of the process;
- Humidity measurement during drying and pressing.

The purpose of the control panel is to command, signal, protect, alert and optimize the performance regarding energy consumption and raw material usage, stabilize sawdust humidity, and regarding hazards and sensitivity to failures.

**Elements** of the general control panel:

- Command and adjustment elements;

- Signaling elements;
- Measuring elements;
- Notifying elements.

#### **Requirements regarding the protection system**

The mounting of electrical installations must be carried out in accordance with the Electrical Installation Mounting Regulations (NMIE).

Electrical equipment, auxiliary equipment and electrical conductors must have the degree of protection in accordance with the NMIE area class.

Protective electric devices are designed to provide protection for circuit elements against overvoltages, overloads, short circuits or power failure.

Overloads in electrical installations are undesirable phenomena, which can lead to damage to conductor insulation, and this damage can cause short circuits with the most undesirable effects (fires, destruction of expensive equipment, interruption of power supply).

The short-circuit overcurrent occurs when two conductors of different potential are in direct contact. The value of this current may be up to 10 times the nominal current of the circuit and has a short duration of action.

The overload current occurs in an abnormal operation and can be up to 20 times the nominal current value, with a long duration of action.

Protective electrical appliances have the role of limiting the effects of breakdowns in order to protect the electrical equipment.

The technological line for producing briquettes must be equipped with the most important protective equipment:

- Fuses;
- Automatic circuit breakers;
- Protection networks;
- Surge arresters.

Protective electrical equipment must detect abnormalities during operational mode and isolate the defective area by means of switching devices.

#### **Requirements for corrosion protection for the equipment**

Given the fact that the technological line consists of metallic equipment, there is a risk that these will be subject to corrosion. Corrosion is a process of alteration due to chemical or electrochemical attacks on metals under the action of acidic and basic substances. Steel corrosion occurs under the action of moisture and oxygen, being accelerated by the action of salts.

Therefore, every equipment in the technological line must be protected from the corrosive effect by one of the following methods:

- Zinc plating;
- Cadmium plating;
- Decorative glossy chromium plating;
- Anodizing;
- Spray casting;
- Plating.

### **Noise protection requirements**

According to the legislation in force (Decision No. 362 of 27.05.2014 on the approval of Minimum requirements for the protection of workers against risks to their health and safety generated or likely to be generated by exposure to noise, in particular against the risks to hearing) the level noise during operation, during the start and shot down of the installation shall not exceed certain limits specified below.

The exposure limit values regarding worker safety and health protection, relative to the daily exposure to noise and peak acoustic pressure are set as follows:

- 1) Noise exposure limit values:  $L_{EX, 8h} = 87 \text{ dB (A)}$  and  $P_{peak} = 200 \text{ Pa}$ , respectively;
- 2) Higher values of noise exposure at the action start:  $L_{EX, 8h} = 85 \text{ dB (A)}$  and  $P_{peak} = 140 \text{ Pa}$ , respectively;
- 3) Lower values of noise exposure at the action start:  $L_{EX, 8h} = 80 \text{ dB (A)}$  and  $P_{peak} = 112 \text{ Pa}$ , respectively).

### **Requirements for ventilation and dust content in the work area**

Law requires industrial ventilation, therefore, in addition to providing the necessary conditions for the technological processes, it is required to achieve and ensure the conditions regarding safety and labor protection.

The ventilation system must be adequate and it has to ensure normal ventilation of the production premises so that the maximum permissible concentration of dust in the working area would not exceed  $15 \text{ mg/m}^3$ .

The electrical panel, the connection point, the transformer will be dimensioned in accordance with the technical designs of the electrical part from the extended technical project.

MEBP will assist the Contractor(s) in arranging and coordinating site visits with the local public institutions responsible for the implementation of projects.

## F. Implementation timeframe

The Contractor is expected to complete the contract in maximum 90 days from the submission of Site data and design conditions, as indicated in the next schedule:

	Deliverables	Timeframe
1	<b>Final Complete Design</b> coordinated and approved by all relevant authorities, with complete tender package	<b>30 calendar days</b> from the submission of Site data and design conditions (30 days from signing the contract)
2	<b>Delivering the specialized and briquetting line equipment</b>	<b>30 calendar days</b> from the submission and approving of the Final Complete Design (60 days from signing the contract)
3	<b>Construction the briquetting line/Final reception</b>	<b>30 calendar days</b> from the submission and approving of the Final Complete Design (90 days from signing the contract)
4	<b>Training of end users and after final receipt consultancy</b>	<b>30 calendar days</b> from the final receipt of works (120 days from signing the contract)

## G. Human Resources

The Contractor(s) shall be responsible for performing all the duties and responsibilities mentioned in the above tasks. The Contractor(s) shall provide, for the duration of the entire assignment activities, all experts technical advice and skills, which are normally required for the entire consultancy services in which they will be engaged under the assignment.

The team of staff required for carrying out the assignment under one single Lot shall include at minimum the following specialists: for design (**Project Manager, HVAC engineers, Automation engineers, Civil Engineers, Architects, Electrical engineers, Building expert, Cost engineers/estimators (quantity surveyors)**) and implementation (**Project manager, lead engineer**).

The company must demonstrate a sufficient number of specialists in each area in order to timely complete the design documentation and construction works as required under the ToR. Lead Engineers shall be specifically highlighted in the Personnel Structure and in the CVs.

The team has to be approved by the UNDP. It is the right of the UNDP to withdraw, at any time, any approval for such staff if found to be unsuitable or otherwise not desirable, in which case the person or persons in question shall be replaced by others approved by the UNDP.

**Site visits:** Bidders are required to visit and examine the Sites and their surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract. Bidders should arrange site visit at their own cost. Bidders should arrange site visits with the following contact person from UNDP: Vitalie Vieru, MEBP Engineer ([vitalie.vieru@undp.org](mailto:vitalie.vieru@undp.org)).

## **H. Management arrangements**

The design and construction project will be monitored by designated UNDP Engineer ("the Engineer") which will carry out systematic monitoring site visit. Additionally, the local administration will hire technical supervisors to monitor daily construction activities.

## **I. Training**

The Contractor will be in charge of line testing and demonstration of production capacity indicated in the bid.

The Contractor should plan and deliver, at his own cost, an on-site training course for 32- astronomical hours for the staff (maximum 5 persons). It will also provide phone consultations for 30 calendar days from the final receipt date. During this period, at the request of the beneficiary, the contractor will, if necessary, ensure at least 4 on-site visits to provide the necessary consultations.

The training should be provided in Romanian (or Russian where required) language or with interpretation in Romanian, if applicable.

The training should include a maximum of 8 hours of basic training regarding the overall functionality, key principles and quality requirements of the raw material, operation requirements and key system controls, maintenance requirements, safety standards, etc., and other 24 hours of hands-on training/demonstration on site. All materials for the training has to be delivered 2 weeks before the training will take place. After the training course, the Contractor, with participation of beneficiary and UNDP representatives shall conduct a test in order to assess the general level of understanding and preparedness of the operators to manage and operate the systems independently. The results must be documented in a minute.

## **J.Commissioning and Taking Over**

After all the equipment are properly installed, construction works finished, trainings conducted, documents provided, then Taking Over of the whole briquetting line shall take place. Partial Commissioning of a briquetting line is not allowed.

Before Taking Over the **test operation** of the briquetting line shall take place during **5 days/8 hours/day**. Test operating is successfully performed if the briquetting line is operating continuously 8 hours without any defects and produce a minimum of 450 kg/hour of briquettes. The time, the fuel used and measurements shall be agreed before between Contractor beneficiary and Engineer. The beneficiary will be responsible for providing the row material.

If the test run is not successful, then test run shall be repeated in full scope after the corrective measures are applied. The repeated test has to be completed no letter than 2 weeks after the first test.

Test operation report should be made in Romanian and summary in English language.

**Notwithstanding the above, UNDP will in no case accept briquetting line with** an efficiency that is lower than the minimum required in the bidding documents under the equipment specifications.

All testing costs shall be included in the bidders' Price Schedule.



#### **K.Warranty Period**

The Warranty period on works shall commence upon the Take Over and last up to **36 month**.

The equipment shall be covered by at least **24 months** warranty on moving/active components and **60 months** warranty on non-moving/passive components.

Separately, the press must be of high quality, with a lifetime of the die of minimum **350 tones**, and of **100 tones** for the screw.

In the event that any part is repaired and/or replaced within warranty period, for that single part new 36 month warranty period starts from the date of repair/replacement. However, the overall duration of warranty shall be limited to maximum 60 months in total for parts that are being replaced or repaired, counted from date of the Take Over.