

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

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### 1 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. The municipal buildings (schools, kindergartens, hospitals etc.) in rural areas of Moldova are heated mainly by fossil imported fuel fired hot water boilers. Fuel prices have increased recently in Moldova. Fuel switching from gas and coal to biomass, as renewable local fuel source, is economical and environmentally preferred heat supply alternative.

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. Among other outputs, it aims at installing at least 80 additional municipal heating systems primarily burning biomass briquettes and pellets from agricultural wastes, with specific focus on Transnistria, ATU Gagauzia, Taraclia district and small towns. Additionally though, in a number of 21 of selected communities the project plans to pilot integrated energy saving and energy-efficiency solutions by installing combined solar/biomass technologies.

In addition to fuel switching, the heat supply distribution piping, connecting boilers and building heating systems, will be renewed to decrease energy losses. Heat supply points in the municipal buildings will be renewed where modern heat temperature control and heat metering equipment will be installed. This increases energy efficiency by better heat supply temperature regulation e.g. decreasing of temperature during night time and during weekends.

The objective of this project is to provide all necessary equipment, labor and services as described herewith and in the attached technical design documentation and BOQs for the installation of biomass based heating systems that will provide reliable heating needs of selected municipal buildings.

Bidders should not be associated, or have been associated in the past, directly or indirectly, with a firm or any of its affiliates which have been engaged by the Purchaser to provide consulting services for the preparation of the specifications, and other documents to be used for the procurement of goods and services to be purchased under this Invitation to Bid.

Bidders must not subcontract parts of works, equipment or any other goods or services from another bidder participating in the tender. Bids submitted by two or more bidders shall be all rejected in case they are subcontractors to each other's bid, or a subcontractor to one bid also submits another Bid under its name as lead Bidder.

### 2 Scope of Works

This scope of work ("Works") includes general construction works and installation of heating equipment, electrical work, plumbing, mechanical works, training, commissioning and tests.

The Contractor shall furnish all labour, engineering, materials, equipment, supplies, transportation, machinery, tools and travel necessary to perform this contract and execute all the works.

It is envisaged that the Works include the following activities:

- **Procurement and supply of all equipment**, materials and services needed for successful completion of the Works, and procurement of hand carts or trolleys for proper operation of the system., depending on the type of fuel and installed boilers.
- **Construction works and installation of all equipment:**
  - Complete briquettes / pellets boiler plants including briquettes / pellets boilers with all auxiliary equipment;
  - Complete heat supply point incl. heat metering system;
  - Heat distribution piping between boiler plant and heat supply point;
  - Fire protection equipment (fire extinguishers, portable mono-block pumps, and sets of firefighting equipment,) for boiler plant and for fuel storage;
  - Construction of a new building, in compliance with national building codes, for boiler plant (if necessary);

- Repair works in the room for heat supply point and/or incorporated boiler plant room (by case);
- Construction of power and water supply nets;
- Territory development works (fences, pavement, outside lights, etc.) around boiler plant and chimney and ash collection place;
- **Commissioning** of all supplied systems, equipment, materials and construction works including making required performance test measurements.
- **The provision of detailed documentation on the operation and maintenance** of supplied heating system incl. the boiler plant and heat supply point.
- **The provision of basic training and training materials** for key persons responsible for boiler plant and heat supply point operation.

All equipment shall be manufactured in accordance with the requirements of the design documentation on each unit of equipment and have European certificate (CE) or local Moldovan certificates, which confirms its passport characteristics.

Contractor shall ensure that all the construction and installation activities are properly coordinated with representatives of building owners, local municipality and UNDP Moldova. Local authorities and UNDP Moldova will assist Contractor in obtaining and requesting necessary approvals, if necessary.

**Note to the Bidders:**

**Whenever the specifications require a particular product of a specific brand name/model, bidders may offer a substitute product that is equal in all respects to the specified product, meeting all its salient physical, functional and performance characteristics.**

### 3 Sites

The Works are grouped as follows:

	Name of Project	Community/District	Contact Person
<b>Lot 1</b>			
<b>1.1</b>	Site 1: Installation of biomass heating system in the gymnasium of the village Tirnova, district Edinet	Tirnova, Edinet	Mayor Cornelia Rusu 0791-08224 Director Dinu Lupuleac 0609-22729
<b>1.2</b>	Site 2: Installation of biomass heating system with solar collectors for domestic hot water in the kindergarten of the village Unguri, district Ocnita	Unguri, Ocnita	Mayor Ivan Cuhari 0799-38007 Director Ludmila Varvarici 0788-59461
<b>1.3</b>	Site 3: Installation of biomass heating system in the gymnasium of the village Ciuciulea, district Glodeni	Ciuciulea, Glodeni	Mayor Calistru Ilei 0692-86679 Director Veronica Iatcu 0673-72566
<b>Lot 2</b>			
<b>2.1</b>	Site 1: Installation of biomass heating system in the gym class and Children Creativity Center of the village Singerii Noi, district Singerei	Singerei Noi, Singerei	Mayor Galina Gutu 0610-04143 Director Lilian Popa 0681-96053
<b>2.2</b>	Site 2: Installation of biomass heating system with solar collectors for domestic hot water in the kindergarten of the village Gvozdova (Gura Camencii community), district Floresti	Gvozdova (com.Gura Camencii), Floresti	Mayor Vadim Tugui 069912876 Director Veronica Titlu 0789-04696
<b>2.3</b>	Site 3: Installation of biomass heating system in the Community Health Center of the village Cazanesti, Telenesti	Cazanesti, Telenesti	Director Cristea Anatolie 0675-67622
<b>2.4</b>	Site 4: Installation of biomass heating system with solar collectors for domestic hot water in the mayor's office, public library and	Mateuti, Rezina	Mayor Angela Ursachi 0254-43236 Director Maria Muntean

	kindergarten of the village Mateuti, district Rezia		0254-43705
<b>Lot 3</b>			
<b>3.1</b>	Site 1: Installation of biomass heating system in the kindergarten nr. 2 Andries of the village Crasnoarmiscoe, district Hincesti	Crasnoarmiscoe, Hincesti	Mayor Alexandr Todesiciuc 0794-81912
<b>3.2</b>	Site 2: Installation of Biomass heating system in the mayor's office of the village Crasnoarmiscoe, district Hincesti	Crasnoarmiscoe, Hincesti	Mayor Alexandr Todesiciuc 0794-81912
<b>3.3</b>	Site 3: Installation of Biomass heating system in the Community Center of the village Zaim, district Causeni	Zaim. Causeni	Mayor Veste Ion 0674-69981
<b>3.4</b>	Site 4: Installation of Biomass heating system in the kindergarten of the village Cupcui, district Leova	Cupci, Leova	Mayor Revenco Mihail 0602-07721 Director Revenco Lilia 0685-03908

Table 1

**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 visits 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)).

#### 4 **Management arrangements**

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

#### 5 **Required Deliverables**

The following is the list of required key deliverables.

**Deliverable 1:** Accomplishment of all construction works, supply and installation of all equipment within **100 calendar days** from Contract signature

**Deliverable 2:** Final Commissioning of works within **120 calendar days** from contract signature, including delivery and installation of the equipment, testing, putting into operation, commissioning and training of operators.

#### 6 **Technical Requirements**

##### 6.1 **Fuel**

As a minimum condition, all the boilers installed within the contract will be operating with biomass pellets made of agricultural wastes compliant with EN 14961-6:2012. More specifically, the boilers shall be tested and demonstrated compatibility with biofuel that meets the following characteristics:

Property class	Units	Specification
Origin and source of raw material	n/a	Cereal straw, sunflower husks, mix of cereal straw and sunflower husks, without additives
Moisture content	w-%	< 10
Density	Kg/m3	> 900
Net Calorific value	MJ/kg	14.5 – 16.0
Ash content	w-% dry	In compliance with EN 14961-6:2012

Table 2

Unless otherwise specified in the design documentation the boilers shall be designed to alternatively operate on biomass briquettes made of the same type of agricultural wastes as specified in Table 2 above.

The contractor will have to supply the fuel necessary for start-up and testing of boilers and heating system as a whole.

## 6.2 Boiler plant

### 6.2.2 Boiler

All the supplied boilers must be manufactured and tested in accordance with the EN 303-5 standard confirmed by relevant certificates issued by an independent certification body.

The emissions levels as well as the boiler efficiency and heat output values shall be determined based on type E biofuel as specified in Table 6 and Table 7 of the EN 303-5:2012. The test fuel shall be in accordance with the EN 14961-6:2012 and Table 2 above. Only in case when the performance tests (emissions levels, boiler efficiency, heat output) were conducted on fuels other than the one indicated above, a manufacturer confirmation shall be provided certifying the boiler compliance to operating conditions indicated above, which is to be confirmed by an independent laboratory testing upon commissioning of works. If not specified otherwise in the design documentation and technical specifications of each site, the boiler efficiency must not be lower than 80% and the emissions level must not be worse than the EN 303-5:2012 Class 3 limits.

Boilers shall be equipped with automatic burner cleaning system by mechanical means.

The contractor shall **provide copies** of the test report in English language.

**For determining the Life-Cycle Cost in comparison of bids, UNDP shall use the minimum boiler efficiency specified by the boiler manufacturer for the respective boiler type or the efficiency rate specified by the bidders in their bids, whichever is lower, and the Life-Cycle Cost calculation of bidders shall be corrected accordingly. Life-cycle cost will be calculated based on a 10 years period.**

### 6.2.3 Ash removal and boiler plant maintenance tool-kit

In each project Site there must be provided solutions of ash removal from the boiler's furnace and heating surfaces, installation of containers for temporary accumulation of ash, which helps to keep the environment clean.

The ash container/s has to be installed in close proximity to the boiler plant and shall be made of minimum 1.5mm steel, with easily removable (hinged) cover. Paint-and-lacquer coating of container have to be heat-resistant and intended for outdoor use. Colour of paint-and-lacquer coating of container has to meet the general architectural requirements and be harmonious with the colour of the boiler plant.

Each boiler plant shall be equipped with suitable tools or mechanism for cleaning of heating surfaces, fire tubes (convective pipes) and flue gas duct/chimney, such as, but not limited to: ash bucket, poker, wheelbarrow, other tools depending on the specifics of each boiler plant and boiler manufacturer recommendations.

More detailed requirements for ash removal are given in the design documents.

### 6.2.4 Fire-fighting equipment

Boiler plant shall be equipped with fire protection solution in accordance with applicable local legislation and norms.

More detailed requirements for fire-fighting equipment are presented in the design documents.

### 6.2.5 Service and Maintenance

Following the commissioning of works the Contractor shall conclude a Servicing and Maintenance Contract with each beneficiary for the provision of the service and maintenance works for a period of 3 years. All the costs for such service shall be included in the Bid and will be covered by the UNDP, however the beneficiary retains all rights for claims against the contractor after the final acceptance of works.

The service and maintenance works shall include:

- Planned on-site maintenance when putting into operation of the heating systems upon commencement of the heating season.
- Planned on-site maintenance works within 3 weeks after the end of the heating season.
- Unplanned maintenance and repair works – at minimum one unplanned on-site emergency service and maintenance visit shall be included annually in the Contract, in total 3 visits during 3 years.
- On-call technical assistance (telephone support) on the operation of the heating system during working days during normal working hours (8:00-17:00). The Contractor should provide free of charge phone number to the beneficiary. The maintenance works shall include the following:

All the service and maintenance works shall be performed by the Contractor's competent personnel as per equipment manufacturers' instructions.

Planned inspections shall include checking the functioning of the whole heating system and its components and equipment: biofuel boiler, boiler control panel, primary and secondary air fans, fuel feeding systems, ash removal system, measurement devices (incl. heat meter), water supply and water treatment system, pumps, valves (incl. regulating valves), emergency alarm system, fire prevention systems, safety valves, electric back-up system, filters, gaskets, nuts, etc. Planned inspection shall include also checking and recording all the operation's parameters (energy consumption, flow, temperatures, pressures, etc.) and adjustment and optimization of the combustion process (burning regime).

Planned on-site maintenance when putting into operation of the heating systems upon commencement of the heating season shall also include among other tasks, heating system pressure test.

The planned on-site maintenance works within 3 weeks after the end of the heating season shall include also visual inspection of the inner surfaces of the combustion chamber, refractory, grate and other parts of the system and determine whether any such part needs replacement prior to the commencement of the next heating season.

The maintenance works shall include lubrication of the equipment (e.g. bearings) if required by the maintenance manuals, replacing of gaskets, cleaning of the filters and tightening of the nuts and bolts.

The cleaning of the biofuel boiler and auxiliary equipment shall be performed by the beneficiary.

Both in case of planned and unplanned service and maintenance, the Contractor shall configure the heating system operating parameters to the most optimal working operating regime.

The Contractor will attempt to resolve all the problems by telephone. The Contractor shall register all the phone calls in the database. If a visit is required, the Contractor will endeavour to visit the site as soon as is possible, but not later than during 48 hours from the phone call. The site visit will be accounted as an emergency service and maintenance visits under item 4).

Warranty cases and related visits shall not be included in the service and maintenance works.

The Contractor shall replace any malfunctioning equipment or wear parts without any additional cost to the beneficiaries.

### **6.3 Marking of equipment**

All the text markings, necessary for system operation (incl. boiler control units), shall be in Romanian language.

All the equipment should have name of the equipment in Romanian language and specific code (number) in accordance with drawing specifications. The name tags should be made from durable white (RAL 9010 or similar) plastic material, height of the font should be 10mm, color of the text should be black (RAL 9005 or similar).

All the equipment should be marked with the manufacturer's original name plate, which should include at least year on construction, equipment manufacturer technical parameters and type/ID of the equipment.

The safety advice label in Romanian language should be fitted on boiler/boiler plant. The label shall be covered with weatherproof plastic coating.

The heat supply point scheme and heating system flow scheme should be located in the heat supply room and shall be covered with plastic coating. Schemes should be at least A3 format.

All the pipes (excluding underground piping) shall be marked properly with required color according to ANSI/ASME A13.1,67/548/EEC or similar standard.

Pipe markers should be positioned so that they can be easily seen from the normal angle of approach - for instance, below the center line of the pipe if the pipe is overhead, and above the center line if the pipe is below eye level. Labels are required at the following locations:

- Adjacent to all valves and flanges
- Adjacent to all changes of direction
- On both sides of wall or floor penetrations

Pipes too small to be directly labelled should be marked with a hanging tag.

## 6.4 Solar Collectors

The solar system shall include all the components specified in the design documents including solar collector with vacuum tubes, bivalent heating boiler, solar pump group, drain back tank, expansion tank for water heater, control panel, security valve, water meter, thermometer, manometer, pipes as may be applicable. The solar collectors shall be certified and comply to the latest version of EN 12975-1 European standard accompanied by Solar Keymark Certificate. All collectors must be freeze resistant and upon installation, the systems must be filled with glycol based heat transfer fluid.

## 6.5 Operation and Maintenance Documentation

Contractor should provide each Site with two (2) copies of detailed documentation on the Operation and Maintenance of supplied heating system incl. the boiler plant and heat supply point. Documentation should be complete, cover all equipment and should include well defined maintenance plan.

All the documentation should be in Romanian and/or Russian language as may be applicable.

The Operation and Maintenance documents shall be presented to UNDP Moldova for review and for approval at least 30 days prior to Commissioning.

To ensure maximum comprehension of technical processes related to sound system functionality, the Contractor will develop, based on the detailed Operation and Maintenance documentation pertinent to the equipment, a set of user-friendly Standard Operating Procedures (SOP), preferably on 2-3 pages for each of the core processes. SOPs are to be made available to each participant at the training.

An indicative list of SOPs could include, but needs not to be limited to the following processes:

- Start-up and shut-down of the systems;
- Monitoring and Control of operation parameters;
- Troubleshooting;
- Fuel feeding;
- Safety requirements for boiler operation;
- Boiler service incl. ash removal;

All SOPs are expected to be compiled in one file and made available – one each Site and presented to UNDP Moldova for review and for approval at least 30 days before Take Over.

## 6.6 Training

The Contractor should plan and deliver, at his own cost, one full day (8 hour) training for boiler plant and heating system operators. The training should be provided in Romanian (or Russian where required) language or with interpretation in Romanian, if applicable. The number of people to be trained from one Site will be maximum 5. Training is expected to be provided to all project sites. If additional training is required, a separate arrangement between Contractor and UNDP Moldova will be negotiated and deployed. Location, number and names of participants and detailed agenda of the training activity shall be discussed and agreed with local municipalities and UNDP Moldova upon Contract signature. The training material shall be presented to UNDP Moldova for review and for approval at least 30 days before first training.

The training should include a maximum of **8 hours of basic training** regarding the overall functionality, key principles and requirements of the heat supply system, boiler operation requirements and key system controls, safety standards, etc., and at least **4 hours of hands-on training/demonstration** on site.

After the training course, the Contractor 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, and Certificates of Successful Completion will be issued in close-operation with UNDP Moldova and building owner (recipient of equipment – beneficiary of the biomass heating system).

## 6.7 Commissioning and Taking Over

After all the equipment are properly installed, construction works finished, trainings conducted, documents provided, then Taking Over of the whole heating system (boiler plant, heat supply point and heat distribution piping and building internal heating system) shall take place. Partial Commissioning of a heating system is not allowed.

Heating system shall be filled up with chemically treated water. Contractor should include all the water purchase costs to his Bid.

For heating system the pressure test shall be made in accordance with local norms and report shall be written Romanian language.

Before Taking Over the **test operation** of the heating system shall take place during **48 hours**. Test operating is successfully performed if the heating system is operating continuously 48 hours without any defects. The heat load conditions, fuel used and measurements shall be agreed before between Contractor and Engineer. Test operation report should be made in Romanian and summary in English language. It is recommended that the boiler manufacturer's representative is participating in the test operation process.

If the test run is not successful, then test run shall be repeated in full scope i.e. 48 hours.

**IMPORTANT NOTE:** As part of the commissioning phase the Contractor shall engage independent accredited laboratory to conduct flue gas **pollutant emissions measurements** and **on-site boiler performance test** in order to confirm the performance characteristics stated in the bid.

As part of the emissions test at least the following pollutants emissions shall be measured to demonstrate boiler compliance with EN 303-5:2012 emissions standards: SO<sub>2</sub>, NO<sub>x</sub>, CO, OGC (Organic Gaseous Compounds) and Dust (Particles Matter) as PM<sub>2.5</sub> and PM<sub>10</sub>.

In the performance test shall be measured the boiler efficiency and heat output in accordance with the agreed methodology and applicable international and local standards.

**In case when upon commissioning of works the boiler efficiency is lower than the specification provided to the tender by more than 1%, the contractor will compensate the difference between the promised Life-Cycle Cost and the actual Life-Cycle Cost calculated based on the actual boiler efficiency determined following the commissioning.** An example of compensation calculation is presented below:

		Life-Cycle Cost at the Tender		Actual Life-Cycle Cost		Compensation
Total Price of Works			150,000.00		150,000.00	
		Life-Cycle Cost Calculation		Life-Cycle Cost Calculation		
No	Parameter	Unit	Value	Unit	Value	
1	Annual heat consumption	MWh	1000.00	MWh	1000.00	
2	Boiler efficiency at nominal output	per cent	85.00%	per cent	82.00%	
3	Annual Fuel demand	MWh	1,176.47	MWh	1,219.51	
4	Net calorific value of the test fuel	MJ/ton	15,000.00	MJ/ton	15,000.00	
5	Net calorific value of the test fuel	MWh/ton	4.17	MWh/ton	4.17	
6	Annual Fuel consumption	tons	282.35	tons	292.68	
7	Estimated Fuel price	USD/ton	110.00	USD/ton	110.00	
8	Annual fuel cost	USD	31,058.80	USD	32,195.10	
9	Discount rate	percent	10%	percent	10%	
10	Expected lifetime of the boiler	year	10	year	10	
11	PV of fuel costs	USD	190,843	USD	197,825	
Life-Cycle Cost (Price of Works + PV of fuel costs)		USD	340,842.87	USD	347,824.93	\$ 6,982.06

The compensation will be rendered in one of the following forms: retention from the amount of payments due to the contractor, validation of the Performance Security, supply of an equivalent amount of biofuel to the beneficiary.

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

All testing costs shall be included in the bidders' Price Schedule. The test fuel shall be in accordance with the specifications stated in Table 2 above.

Contractor shall decide the right time for the test, taking ambient air conditions into account, organize the test instruments, make sure all local measurement grid points are in order, install all test instruments at the specified areas, do a trial test, and declare the guarantee test. Test should be carried out during the heating period. Report with all measurements and calculations shall be made in Romanian and summary in English language.

The contractors will have to supply the fuel necessary for start-up and testing of boilers and system as a whole.

UNDP reserves the right to employ independent laboratories to conduct its own verification of the emissions and performance parameters of the heating systems.

## **6.8 Warranty Period**

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

The biomass boiler shall be covered by at least **36 months** warranty on moving/active components and **60 months** warranty on non-moving/passive components.

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.