

**DETAILED ENERGY AUDITS**  
**TERM OF REFERENCE**  
**BOSNIA AND HERZEGOVINA/REPUBLIC OF SRPSKA**  
**SCALING-UP INVESTMENT IN LOW-CARBON PUBLIC BUILDINGS PROJECT**  
**UNDP/GCF-BIH10/00103203-RFP-CQ-CS-21-25-FRS**

**a. Background Information and Rationale, Project Description**

1. The Environmental Protection and Energy Efficiency Fund of Republic of Srpska has been financed by UNDP/GCF towards the cost of an Scaling-up Investments in Low-Carbon Public Buildings in Bosnia and Herzegovina. The project development objective is to demonstrate the benefits of energy efficiency improvements in public sector buildings and support the development of scalable energy efficiency financing models.
2. The objective of the Energy Efficiency Project's corresponds to goals underlined in the Law on Spatial Planning and Construction of Republic of Srpska and the Law on Energy Efficiency of Republic of Srpska, both adopted in 2013.
3. Scaling-up Investments in Low-Carbon Public Buildings in Bosnia and Herzegovina will support energy efficiency investments ("subprojects") in schools, hospitals and clinic centers. A small number of other public facilities (e.g., elderly homes, orphanages, other administrative buildings) may also be included. The project will finance energy efficiency upgrades/renovations of buildings, as well as related technical consultancy services (e.g., energy audits, technical and social monitoring and evaluation, technical designs, supervision and subproject commissioning). The selection and implementation of subprojects will be conducted in three annual batches.
4. These investments will reduce the energy consumption of selected public buildings, and demonstrate the economic viability of energy efficiency improvements, including reduced recurring energy costs and associated public expenditures. In addition, the subprojects will generate demonstrable co-benefits, such as reduced CO<sub>2</sub> emissions and improved indoor comfort levels (e.g., improved indoor temperature, better lighting and indoor air quality). The results indicators against which the implementation progress of (Low carbon will be measured against include: lifetime energy savings, lifetime fuel savings, greenhouse gas savings, increase in end-user satisfaction, number of buildings with EU-compliant energy certification, number of municipal energy managers trained, number of subprojects commissioned, and direct project beneficiaries.
5. The Project Implementation Unit (PIU) within the Environmental Protection and Energy Efficiency Fund of Republic of Srpska will be responsible for preparation, coordination, management and implementation of the project, including procurement, contracting, and payments of all goods, works and services related to the project.
6. These Terms of Reference (ToR) define the nature and detailed scope of an assignment to provide engineering services, which include preparation of technical designs.

## **b. Specific Objectives**

The overall objective of the assignment is to perform comprehensive detailed energy audits, audits for energy certificate and preparation of BoQs for identified energy efficiency measures on rehabilitation of 16 public buildings in RS.

## **c. Scope**

The outcomes of this intervention are:

- Development of 16 Detailed energy audits for Public sector buildings
- Audit for energy certificate of 16 Public sector buildings
- Preparation of BoQs for identified energy efficiency measures on rehabilitation of 16 Public sector buildings

## **d. Outputs/ tasks**

### **d.1.1. OUTPUT/TASK 1: The detailed energy audit for public buildings activities include following tasks**

#### **1. DETAILED ENERGY AUDIT-OF PUBLIC BUILDINGS**

***The detailed energy audit activities include the following tasks:***

- Conduct a detailed energy audit of public buildings.
- Conduction of on-site measurements of selected facilities to determine energy losses, current energy efficiency of the heating and lightning system and building user pattern.
- Classify the energy rating/energy class of selected facilities in accordance to the EU Energy Performance Building Directive / legislation on energy classification of buildings.

#### **List of 16 public buildings**

<b>#</b>	<b>Public Building/Naziv Objekta</b>	<b>City/Grad</b>	<b>Area/Povrsina [m<sup>2</sup>]</b>
1	Public Building 1		≤ 3.000,00
2	Public Building 2		≤ 3.000,00
3	Public Building 3		≤ 3.000,00
4	Public Building 4		≤ 3.000,00
5	Public Building 5		≤ 3.000,00
6	Public Building 6		≤ 3.000,00
7	Public Building 7		≤ 3.000,00
8	Public Building 8		≤ 3.000,00
9	Public Building 9		≤ 3.000,00
10	Public Building 10		≤ 3.000,00
11	Public Building 11		≤ 3.000,00
12	Public Building 12		≤ 3.000,00
13	Public Building 13		≤ 3.000,00

14	Public Building 14		≤ 3.000,00
15	Public Building 15		≤ 3.000,00
16	Public Building 16		≤ 3.000,00
<b>Total/Ukupno:</b>			<b>48.000,00</b>

NOTE: Estimated building area is 2500m<sup>2</sup>.

**Note: Confirmed list of public buildings will be shared with company.**

Within the audit activities, the auditor must:

- 1.1. Analyse energy characteristics of the building and characteristics of energy consumption and cost management;
- 1.2. Analyse energy costs and projections of further energy consumption;
- 1.3. Analyse possible measures of increasing energy efficiency of the building;
- 1.4. Propose measures of increasing energy efficiency of the building;
- 1.5. Analyse energy, economic and environmental related effects of proposed measures;
- 1.6. Perform comparative analysis of energy consumption indicators of the building in comparison with other buildings of similar purpose;
- 1.7. Provide recommendations for energy management within the building;
- 1.8. Prepare and deliver final report on detailed energy audit of the building;

**1.1 Analyse energy characteristics of the building and characteristics of energy consumption and cost management to include:**

- Filled visit and necessary information gathering;
- General part – short description of characteristics of energy consumption and cost management, responsible persons, energy costs financing, decision making system about investments into the building maintenance, functioning of the energy consumption information system, motivation for applying energy efficiency measures;
- Analysis of thermal characteristics of the building envelope;
- Analysis of energy characteristics of the building heating system;
- Analysis of energy characteristics of the building cooling system;
- Analysis of energy characteristics of the building consumable hot tap water preparation system;
- Analysis of energy characteristics of the building electrical consumption system – electrical installations, lighting, gadgets and other consuming devices;
- Analysis of energy characteristics of specific subsystems (kitchen, laundry, etc.);
- Analysis of sanitary water consumption;
- Analysis of the system of regulation and management;

**1.2 Analyse energy costs and projections of further energy consumption to include:**

- Analysis of all costs related to energy and water for a period of 36 months;
- Analysis of the characteristics of energy and water consumption
- Determination of relevant indicators of energy consumption for the subject building;

**1.3 Analyse possible measures of increasing energy efficiency of the building to include:**

- Increase of thermal performance the building envelope;
- Increase of energy characteristics of the facility heating system;
- Increase of energy performance of the facility cooling system;
- Increase of energy performance of the system for preparation of consumable hot water;
- Increase of energy performance of the electric energy consumption system;
- Analysis of possibility of fuel replacement or usage of renewable energy sources to generate heat energy;
- Improving system of regulation and management;
- Improving water supply system;

**1.4 Propose measures of increasing energy efficiency of the building to include:**

- Detailed description of each measure proposed to increase energy efficiency of the building;
- If the building is heated on oil/coal boilers, there must be foreseen measure for replacement/installation of new biomass/pellet-fired boiler. In this case instalment of appropriate system for remote readings based on the M-Bus system of meter readings must be included, which is standardized according to EN1434-3. System for remote readings should include following:
  - Central cabinet which is the M-Bus device - Data Logger with GPRS terminal used for the transmission of stored readings to a central server. Electricity supply 220V 50Hz.
  - To measure the consumption of thermal energy M-Bus module will be used (which will be delivered together with the calorimeter), so it is only necessary to foreseen cabling from the calorimeter to the central cabinet.
  - For cabling of the entire M-Bus network cable JY (St) Y 2x2x0.8 mm must be used.

**1.5 Analyse energy, economic and environmental related effects of proposed measures to include:**

- Quantitative analysis of energy savings;
- Quantitative analysis of the economic savings;
- Up to three scenarios of implementation of the proposed measures to increase energy efficiency of the building.
- Provide following output table for identified measures and scenarios:

	Investment [BAM]	Savings of heat energy [kWh]	Financial savings for heat energy [BAM]	Savings of electrical energy [kWh]	Financial savingsfor electrical energy [BAM]	Expected simple payback [years]	Specific savings per amount of investement (2+4) / (1) (kWh/BAM)
	1	2	3	4	5	6	7
Measure 1							
Measure 2							
Measure 3							
Measure n							

<b>Measure n+1</b>							
<b>Scenario 1</b> (measure x + measure y)							
<b>Scenario 2</b> (measure x + measure y + measure z)							
<b>Scenario 3</b> (measure x + measure y + measure z + measure...)							

	<b>Investicija</b> [KM]	<b>Ušteda</b> <b>toplotne</b> <b>energije</b> [kWh]	<b>Ušteda</b> <b>troškova</b> <b>toplotne</b> <b>energije</b> [KM]	<b>Ušteda</b> <b>električne</b> <b>energije</b> [kWh]	<b>Ušteda</b> <b>troškova</b> <b>električne</b> <b>energije</b> [KM]	<b>Očekivani</b> <b>jednostavni</b> <b>povrat</b> <b>investicije</b> [godina]	<b>Specifične</b> <b>uštete po</b> <b>iznosu</b> <b>investicije</b> (2+4) / (1) (kWh/KM)
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>Mjera 1</b>							
<b>Mjera 2</b>							
<b>Mjera 3</b>							
<b>Mjera n</b>							
<b>Mjera n+1</b>							
<b>Scenarij 1</b> (mjera x + mjera y)							
<b>Scenarij 2</b> (mjera x + mjera y + mjera z)							

<b>Scenarij 3 (mjera x + mjera y + mjera z + mjera...)</b>							
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\* Savings and investment costs must be calculated with incl VAT and without VAT / Uštede i investicije izračunati sa sadržanim PDV-om i bez PDV-a.

**1.6 Perform comparative analysis of energy consumption indicators of the building in comparison with other buildings of similar purpose to include:**

- Comparison of relevant indicators of energy consumption of the subject building with similar facilities in RS and the region for the current state of energy consumption
- Comparison of relevant indicators of energy consumption of the subject structure with similar facilities in RS and the region following the implementation of the proposed measures to increase building energy efficiency.

**1.7 Provide recommendations for energy management within the building to include:**

- Qualitative recommendations for energy and water management in order to achieve and maintain the calculated values of energy savings;

**1.8 Drafting final report on the detailed energy audit of the building to include:**

- All above stated items
- Measurement results as separate appendix (Thermo-graphic imaging of the construction parts of the building envelope; Results from flue gas analysis, excess air and other needed variables to determine combustion efficiency
- Energy class in accordance to the EU EPBD directive (2010/31/EU) e.g. legislation on energy classification of buildings

**ON SITE MEASUREMENTS AND TESTING OF SELECTED FACILITIES TO DETERMINE ENERGY LOSSES, CURRENT ENERGY EFFICIENCY OF THE HEATING AND LIGHTNING SYSTEM AND BUILDING USER PATTERN**

With the aim of clearly defining the current state of energy consumption, and in order to determine the accurate input parameters needed for energy and economic calculations of expected energy savings of the given buildings, the auditor is required to take on-site measurements, including (but not limited to):

- Thermo-graphic imaging of the building envelope;
- Thermo-graphic imaging of heating distribution system;
- Thermo-graphic imaging of heating bodies;
- Flue gas analysis, excess air and other needed variables to determine combustion efficiency
- Measurement of electricity parameters (power, voltage, etc.);
- Determine the temperature of building surfaces;
- Determine the level and intensity of illumination;
- Measurement of heat flow through the building envelopes (heated space-outer space, heated space- unheated space, unheated space-outer space);

The Final report on the detailed energy audit of the building should include:

- All items stated under the activity *detailed energy audit of public buildings*.
- Measurement results as separate appendix (Thermo-graphic imaging of the construction parts of the building envelope; Results from flue gas analysis, excess air and other needed variables to determine combustion efficiency.

#### **d.1.2. OUTPUT/TASK 2: The audit for energy certificate of public sector buildings activities includes following tasks**

The energy certification audits activities include the following tasks:

1. Calculate the energy performance rating/class (including  $Q_{hnd}$  for referent and real climate conditions) per  $m^2$  and  $m^3$ ;
2. Provide energy characteristics of public buildings using market-proven software which enables the calculation of energy performance rating/class (energy characteristics) for each public building element of the outside envelope (of heated area); based on EN 13790 and on the methodological approach for conducting energy performance certification of public sector buildings.
3. Prepare and deliver final report (hard copy and electronic) on energy certification/energy class/rating for each public building;

In order to classify the buildings into the energy rating/energy class, in accordance to the EU EPBD directive (2010/31/EU), the service provider must follow and base their energy related calculations on EU norms and standards as well as technical legislations.

The Final report on energy certification audits of the building should include:

- energy certification audits and energy certificates submitted separately for each building.

#### **d.1.3. OUTPUT/TASK 3: Development of BoQs for identified energy efficiency measures of rehabilitation of public buildings activities include following tasks**

The development of BoQs activities include the following tasks:

1. Review existing project documentation (project design, drawings, sketches etc.) and incorporate into BoQ for tendering the works and further rehabilitation of public buildings;
2. Prepare BoQs for identified energy efficiency measures of rehabilitation of public buildings for construction/civil works, mechanical works and electrical works, in the following form (the form is used as an indication) in local language:

PREDMJER I PREDRAČUN RADOVA
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Objekat:					
Red. br.	Opis stavke	Jed. mj.	Količina	Jed. cijena. bez PDV	Ukupno bez PDV
<b>I Pripremni radovi</b>					
1					
<b>I Ukupno pripremni radovi</b>					<b>0.00</b>

II Limarski radovi					
1					
<b>II Ukupno limarski radovi</b>					<b>0.00</b>

III Zidarski radovi					
1					
<b>III Zidarski radovi</b>					<b>0.00</b>

IV Fasaderski radovi					
1					
<b>IV Ukupno fasaderski radovi</b>					<b>0.00</b>

REKAPITULACIJA		
Poz.	Vrsta radova	Iznos (KM)
I	Pripremni radovi	0.00
II	Limarski radovi	0.00
III	Zidarski i AB radovi	0.00
IV	Fasaderski i radovi	0.00
<b>Ukupno bez PDV</b>		<b>0.00</b>



	PDV 17 %	0.00
	Ukupno sa PDV	0.00

3. Provide additionally required inputs into BoQ based on further input from Fund team for each public building;
4. Prepare and deliver final report (hard copy and electronic) on BoQ for each public building separately;

Fund remains the right to ask for additional corrections which need to be incorporated into final BoQs after the submission of final version of BoQs and after the agreement with the service provided has been delivered, if Fund proves that a mistake has been made by the service provider.

The Final report on development of BoQs of the buildings should include:

- BoQs submitted separately for each building and cumulatively for all buildings.

#### **e. Approach and Methodology**

This section should demonstrate the Offeror's in-depth understanding of the purpose and objectives of the ToR and provide the Offeror's approach to structuring and most effective implementation of the service. In addition, this section should clearly show the Offeror's understanding and sufficient detailed consideration of all important aspects of the service with regard to providing business Development Services training courses and conducting market assessment of commodities or sub-sectors.

Being the core instrument for the successful provision of the service, the proposed by the Offeror methodology shall undoubtedly demonstrate capability to reach the envisaged results of the ToR and strong relevance to the specific scope, objectives and range of tasks in a complex manner.

This section should propose the Offeror's vision and approach to organizing and performing the tasks as stated within the ToR and as per the overall scope and objectives of the service in the most logical, realistic, efficient and relevant to the context in BiH manner.

This part shall also contain a general work plan, which illustrates the anticipated work-flow and timeframe of implementation of the tasks and activities.

#### **f. Deliverables and Schedules/Expected Outputs**

For all buildings, the Final report on the detailed energy audits, energy certification and BoQs should include:

1. All items stated under the activity *in this ToR*
2. Measurement results as separate appendix;

The service provider will deliver two hard copies in colour for each output and two electronic versions on separate CD's.

Successful Offeror will be requested to conduct the services in accordance to the table below. This indicates **key steps** of the services to be undertaken.

**Deliverables:**

Activity (as per TOR)	Estimated completion deadline
Delivery of Final reports on the detailed energy audit, energy audits for certification and BoQs of 4 public buildings	February 2023
Delivery of Final reports on the detailed energy audit, energy audits for certification and BoQs of 4 public buildings	March 2023
Delivery of Final reports on the detailed energy audit, energy audits for certification and BoQs of 4 public buildings	April 2023
Delivery of Final reports on the detailed energy audit, energy audits for certification and BoQs of 4 public buildings	May 2023

**For all DEAs – The Contractor must perform corrections If significant errors/mistakes within energy audits, energy certificates and BoWs are identified on a later stage (after contractual obligations of both parties).**

**g. Key Performance Indicators and Service Level**

Key performance indicators are as follows:

- All activities completed by defined deadlines and reports delivered in time.

All key activities and deliverables will be subject to review by Fund team and Project partners.

**h. Governance and Accountability**

Monitoring and evaluation of the Service Provider’s work will be conducted by the Fund team. Apart from the reports specified as deliverables, the service provider is expected to report monthly informing on the progress made; results and deliverables in place; critical reflection on issues and challenges faced, or these that may need attention in the following period. Template for these reports will be provided by Fund.

Fund withholds the right to request additional periodical updates/reports on particular issues. All reports will be submitted in writing to the above-mentioned persons.

Due to complexity of the tasks, Service Provider will need to appoint at least one person who will at all times be responsible for keeping track of plans, activities, progress reports and ongoing issues.

**i. Facilities to be provided by Fund**

The Contractor will be provided with contact data of Municipalities/end-users if he has the same. However, Contractor’s obligation is to ensure all required data in order to provide the required deliverables.

**j. Expected duration of the contract/assignment**

Expected duration of work is 6 months starting from January 2023 . Expected date of full completion of all activities is June 2023.

### **k. Duty Station**

Activities will be conducted at the premises of the service provider and the locations of public buildings subject to this ToR.

### **l. Professional Qualifications of the Successful Contractor and its key personnel**

This section should provide information of the Offeror, to include the year and state/country of incorporation and a brief description of the Offeror's previous and present activities most relevant to this ToR, as well as description of specific knowledge and previous experience in areas within the scope of this Quotation, structured in the following manner:

- Vendor is legally registered entity;
- The Service Provider must have Licence for performing of Energy Audits and that: Energy Audit of buildings for which a building permit is issued by the Fund of Physical Planning, Construction and Ecology Republic of Srpska;
- Minimum 3 years of relevant experience;
- Minimum 2 contracts of similar scope, nature and complexity implemented over the last 5 years.
- Experience in execution of detailed energy audits in public sector building proven through reference letters and/or contracts for implementation of at least 50 public buildings of similar complexity. References must include investors' contact details, project values, square meters, etc.;
- Experience in preparation of project design documentation (BoQs, drawings, schemes etc.) for public sector buildings proven through reference letters and/or contracts for implementation in RS/BIH. References must include investors' contact details, project values etc.;
- Strong analytical skills – statistics and visualization;
- Good and proven experience and skills on general communication and co-operation;
- Good and proven experience in dealing with governments and local authorities;
- Experience with facilitating inter-institutional cooperation and stakeholder involvement;
- Ownership or lease of relevant measurement equipment;
- Experience with facilitating inter-institutional cooperation and stakeholder involvement;
- Expertise of Offeror's full time employed employees or independent consultants, with the following minimum key staff requirements:

-The Service Provider must have a proposed team of five (5) requested experts (at least three engineers must be full time employees). In addition to that, at least three (3) engineers must possess a License for performing of Energy Audit of buildings obtained from Environmental Protection and Energy Efficiency Fund of Republic of Srpska

Key personnel is expected to include:

**Expert 1 - Lead Expert:** At least one (1) university graduate mechanical/civil/architecture engineer with minimum of 5 years of experience

- Professional experience in:
  - conducted detailed energy audits in public building sector;
  - calculations of energy performance in public building sector;
  - energy efficiency in public building sector.

- **Expert 2 - Mechanical Engineer Expert:** At least one (1) university graduate mechanical engineer with minimum of 5 years of experience
  - Professional experience in:
    - conducted detailed energy audits in public building sector;
    - calculations of energy performance in public building sector;
    - energy efficiency in public building sector.
  
- **Expert 3 and Expert 4 - Architect or Civil Expert:** At least two (2) university graduate architect or civil engineer with minimum 5 years of experience
  - Professional experience in:
    - conducted detailed energy audits in public building sector;
    - calculations of energy performance in public building sector;
    - energy efficiency in public building sector.
  
- **Expert 5 – Electrical Expert:** At least one (1) electrical engineer with minimum 5 years of experience
  - Professional experience in:
    - conducted detailed energy audits in public building sector;
    - calculations of energy performance in public lighting systems and public building sector;
    - energy efficiency in public building sector.

In addition, interested Consultants may also include additional non-key staff, as needed to meet the TOR and workload. The team should also have expertise in energy consumption in buildings, energy audits for buildings, experience with use of measuring devices use (temperature, humidity, fuel flow and heat meters, illumination level metering, etc.), electric systems/lighting. The consultant shall demonstrate the availability of instrumentation needed for measurements during the energy audit, such as infrared imaging camera, environmental, power meter, etc.

#### **m. Price and Schedule of Payments**

Payments of the delivered services will be done according to the following timetable:

- 25 percent upon successful completion of activities and upon submission and approval of deliverables for four (4) Public Building (to be submitted not later than February 2023)
- 25 percent upon successful completion of activities and upon submission and approval of deliverables for four (4) Public Building (to be submitted not later than March 2023)
- 25 percent upon successful completion of activities and upon submission and approval of deliverables for four (4) Public Building (to be submitted not later than April 2023)
- 25 percent upon successful completion of activities and upon submission and approval of deliverables for four (4) Public Building (to be submitted not later than May 2023).