

**BOSNIA AND HERZEGOVINA
FEDERATION OF BOSNIA AND HERZEGOVINA
ADDITIONAL FINANCING FOR ENERGY EFFICIENCY PROJECT–ID P165405**

TERMS OF REFERENCE FOR CONSULTANCY SERVICES

PREPARATION OF DETAILED ENERGY AUDITS

1. Background:

The Government of Bosnia and Herzegovina (BH) has recognized the importance of energy efficiency to support sustainable economic growth and move towards EU accession and has received the financing for the Additional Financing for the Bosnia and Herzegovina Energy Efficiency Project (AF) from the International Bank for Reconstruction and Development (IBRD) credit funds. 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.

The project will be supported by a US\$32 million IBRD/IDA credit funds for BH, which is made available to the two entities (US\$ 19.23 million allocated to the Federation of Bosnia and Herzegovina (FBH)). The project will consist of three components implemented separately in each entity:

Component 1: Energy efficiency investments in public facilities

Component 2: Support for the development of scalable financing mechanisms and capacity building

Component 3: Project Management

The project implementation unit (PIU) established within the Federal Ministry of Physical Planning (FMPP) will be responsible for the preparation, coordination, management and implementation of the project in the Federation of Bosnia and Herzegovina, including procurement, contracting, and payments of all goods, works and services related to the project.

This Terms of Reference (ToR) define the nature and detailed scope of an assignment to prepare Detailed Energy Audit.

2. Objectives

For the preparation and implementation of energy efficiency investments in public buildings (financed under Component 1 outlined above) in 2020, the PIU on behalf of the FMPP ('the client') intends to hire a Consultant Company ('the consultant') who will prepare Detailed Energy Audits for 48 public buildings. The list of 48 buildings is provided in Annex 1.

Detailed Energy Audits will be performed from the annual list prepared by the PIU. The Consultant(s) will refer to PIU for all issues that could appear in the execution of the task, and for decisions that would have to be made in reference to the present contract. The Federal Ministry of Physical Planning (FMPP) will be considered as the Client, even if some actions

and/or decisions will have to be coordinated with the relevant Ministries and with the local administration, schools, Hospitals, Cantons and Municipalities.

3. Description and Scope of Services:

3.1 GENERAL DEFINITION OF SERVICES

The services will be performed for the public buildings listed in Annex 1 of this ToR. The services to be provided by the Consultant are described in detail in section 3.2.

3.2 DETAILED SCOPE OF WORK

Detailed Energy Audit

Based on Regulation of Performing Energy Audit and Issuing Energy certification (Official Gazette Federation of B&H N^o 87/18), Detailed energy audit includes detailed energy analysis of all construction and technical systems in the building. For existing buildings, depending on the use, the energy costs through optimal 36 months are analyzed in order to model the energy consumption and estimate the energy needs in the building. The analysis, as appropriate, is completed with the necessary measurements of electric energy consumption estimates of heat losses through construction elements: external walls, roof, selling, floors, doors and windows, ventilation losses of the building, etc. which is important to determine the energy losses in the individual systems. The collected data is processed and the energy characteristics of the analyzed building are calculated. Proposed measures to increase energy efficiency must be classified into categories according to the energy, economic and environmental contribution, and if necessary, recommend detailed measurements of energy consumption.

Stages of a detailed energy audit are:

- Meet and talk with key people in the building - the manager and the users / owners
- Review of existing project documentation, if available
- Review and analyze the accounts with data on thermal and electric energy consumption and water for optimal 36 months (required only for public buildings)
- Develop the detailed energy audit of the building and the implementation of necessary consumption measurements, after identifying key gaps.
- Carry out the necessary measurements (Thermal imaging, flue gas analysis, measuring the level of lighting, electrical measurements, etc.)
- Revisit the conversation with key people in the building
- Analysis and processing of collected data
- Based on Rolebook of Minimum Energy performance Requirements (Official Gazette of Federation of B&H N^o 81/19) and Its Annexes(Official Gazette of Federation of B&H N^o 85/19), identification of measures to improve energy characteristics of the building and increase energy efficiency (three scenarios) with an imperative to implement substantial measures.
- The energy, economic and environmental evaluation of the proposed measures
- Preparation of the report with conclusions and recommendations, as well as presentations to key people

- Brief table review of basic informations: measures to be implemented, index of savings, payback period, number of users, heated area, construction period, fuel before and after retrofitting ...

4. Output/Deliverables:

The deliverables consist of Detailed Energy Audit Report and Summary of Detailed Energy Audit Report for 48 public buildings. The list of 48 buildings is provided in Annex 1.

Detailed Energy Audit Report for each building shall be submitted on-line into the Register of Energy Certificates in Federal Ministry of Physical Planning (REC), three (3) hard copies and one (1) electronic copy (PDF) and Excel or other format for calculations. This document prepared by the Consultant should be in local language. A Detailed Energy Audit study should have a structure specified in the Annex 2 in line with THE GUIDELINES FOR EXECUTING ENERGY REVIEWS FOR NEW AND EXISTING OBJECTS WITH A SIMPLE AND COMPLEX TECHNICAL SYSTEM // Sarajevo, august 2009. year approved by the Federal ministry of regional planning.

NOTE: The contents of the DEA must be sorted according to Annex 2.

Summary of Detailed Energy Audit Report for each building shall be submitted in three (3) hard copies and one (1) electronic copy (PDF) and Excel or other format for calculations. This document prepared by the Consultant should be in English. A Summary of Detailed Energy Audit Study should have a same structure as Detailed Energy Audit Study but limited to 10 pages and also in the Excel form specified in the Annex 3.

5. Description of potential energy efficiency measures

The investment could include but not be limited to the following energy efficiency measures:

5.1. Retrofitting of windows

The type of reconstruction will be selected from the following options:

- Full replacement of windows with no reduction of glazing area (optimization of windows opening systems, technical specification of glass package, window frame material)
- Window repair and fitting of mountings

Window replacement with eventual reduction of glazing area whenever the lighting level remains in compliance with the standards, for instance in the corridors of a school

5.2. Roof insulation and renovation

The reconstruction types will be selected from the following options:

- Full/Partial replacement of roofing, with insulation preserving the existing structure (mandatory replacement of roof covering such as asbestos-cement for safety reasons)
- Repair and insulation of a pitched/flat roof
- Replacement and insulation of a pitched roof
- Other options of reconstruction.

5.3. Wall insulation

The insulation types will be selected from the following options:

- Outside insulation with a normalized technology including a good glue mortar quality, insulation material, an external coating of glue mortar with mesh, a finishing coat and plastering
- Eventually, other options of insulation from outside and/or inside.

5.4. Thermostatic and balancing valves

Installation of thermostatic radiator valves and balancing valves on the risers in order to improve the radiator and network efficiency as a complement to the temperature control that will be installed in the new substations. Local temperature control shall be implemented consistently by use of TRVs in case building envelope EE measures are applied, particularly when windows are replaced; as a rule, prior to the installation of TRVs radiators should be cleaned (washed) while all radiators fittings should also be replaced.

5.5 Automatic central heating control

Automatic central heating control as low cost EE investment should be properly addressed and applied consistently regardless of the heat source and fuel used. This measure should also include installation of balancing valves and conducting heating installation hydraulic balancing. This is obligatory measure to be propose/applied.

5.5. Heat substation

Technical specifications for the parts of the substations that are to be replaced or modernized with the aim of controlling automatically the water temperature according to the outside air temperature, and/or implementing variable speed pump if cost effective. This is obligatory measure to be propose/applied.

5.6. Reconstruction of boiler houses (including fuel conversion of boilers)

The measure could be a suggestion for total or partial boiler replacement including a fuel switch for the boiler.

The measure could include works both for dismantling the old equipment and for supplying and installing a new one. Economic comparison between all options (retrofit, replacement, change of fuel use of biomass) will be provided.

5.7. Rehabilitation of lighting systems

The measures could be to change or improve the lighting system in the room and in the buildings As a rule, in the schools the rehabilitation of lighting will include the full replacement of existing lighting by efficient luminaries and bulbs to ensure adequate and proper lighting in the classroom, and to improve the learning environment. Economic comparison between options proposed, in particular when the new efficient lighting implies the retrofitting of the electrical network and cabinets. This measure should not only focus on replacement of incandescent bulbs with LED bulbs (CFLs should not be used) but also to replacement of fluorescent tubes with LED tubes with or without replacement of all luminaries;

5.8. Potential Limited Ancillary Measures

Limited additional funding (up to 10 percent of total investment costs per building) may be provided to finance ‘ancillary measures’ (i.e., energy efficiency measures with longer payback periods or other measures) to ensure reasonably full renovation or longevity of the investment (e.g., replacement of old gutters and down spouts to ensure that building envelopes do not get damaged by water).

6. Time Schedule

The time schedule for the Consultant(s) is as follows:

The deliverables shall be submitted not later than 90 calendar days following signature of contract.

7. Qualification requirements and basis for evaluation

The Consultant should be a consulting firm with the relevant project experience - specialized knowledge in the field of energy efficiency in the building sector. Experience in implementing similar programs / projects / consultancy services in the field of energy efficiency in the building sector in the Federation of Bosnia and Herzegovina as well as previous experience in implementing energy audits confirmed through references and / or contracts for at least fifteen (15) detailed energy audits in public buildings in the past three (3) years (references must be submitted to prove the details of the contract with the investor, proof of the value of the project , etc.).

Interested consultants must provide information indicating that they are qualified to perform the services by fulfilling following requirements:

- Company information: name, registration, address, telephone number, facsimile number, year of establishment, contact person for the project, fields of expertise;
- Hold a license from Federal Ministry of Physical Planning for energy audit and certification of buildings for complex building systems in FB&H, or if not available will be obtained within 30 days as condition to sign the contract. Such consultant shall provide a confirmation along with the EOI that he will secure the license in case he is selected to submit technical/ financial proposals
- Details of experience in minimum fifteen (15) similar assignments undertaken in last three (3) years including value of consulting services and value of works, location, name of the Client, type of services provided, contract period of execution.
- The Consultant will justify its capabilities through engagement of professional staff for the execution of project activities in defined timeframes, including all the necessary specialist engineers. For this purpose, the consultant will submit a CV of engineers who will work on the project. Work should be done by a consulting firm consisting of experts who have the following skills and credentials:
- Key personnel
 - At least six (6) university graduate mechanical engineers', with minimum five (5) years' experience

- At least nine (9) additional staff members, from which two (2) should be economist that will be engaged to this project and another seven (7) (e.g. architect, civil engineers, electro engineers etc.), with minimum three (3) years' experience
 - Engineers have to have proof that they have passed examination in detailed energy auditing and certification and minimum of two years of consultancy experience in the field of energy efficiency,
- If the case may be, form of association (sub-contractor or joint venture up to three members) for the execution of the contract and identification of the leading company. In the case of joint venture all members shall be jointly and severally liable for the entire assignment. Same information, including licences, must be submitted for the leading company and the associate companies;

Annex 1 - The list of buildings with details

No. #	Building Name	Canton	City	Address	Name and Position of the Contact Person	Phone Number	Heated area m2
1	Ministarstvo zdravstva	West Herzegovina Canton	Grude	Stjepana Radića bb	Tomislav Pejić Ministar	+387 39 661 675 ministarstvo.zrss.zzh@tel.net.ba	400,00
2	JU TREĆA GIMNAZIJA SARAJEVO	Canton Sarajevo	Sarajevo	Vilsonovo šetalište br 16	Senada Salihović, Direktor	+387 61 437 166	4.258,00
3	Prva bošnjačka gimnazija	Canton Sarajevo	Sarajevo	Petrakijina 21	Naida Hota Muminović, Direktor	+387 61 256 142 Tel: +387 33 227 096 Fax: +387 33 668 212 skola@bosnjackagim.edu.ba	4.000,00
4	Zgrada Ekonomskog fakulteta Univerziteta u Sarajevu	Canton Sarajevo	Sarajevo	Skenderija br. 70	Senada Laličić, rukovodilac Službe za opće poslove,	+387 33 275-945	2.400,00
5	Fakultet zdravstvenih studija Univerziteta u Sarajevu	Canton Sarajevo	Sarajevo	Bardakčije 1, Sarajevo	Azija Pašalić, Dekan	+387 62 102 685	3.800,00
6	UKCS -TREĆA INTERNA stari dio	Canton Sarajevo	Sarajevo	Bolnička 25, Sarajevo		Email: info@kcus.ba; Telefon: + 387 33 29 70 00 Fax: + 387 33 26 59 10	1.116,00
7	JU OŠ "Poljice" Lukavac	Tuzla Canton	Lukavac	Poljice bb	Alma Gutić, Direktor	+387 35 540-698 skolapoljice@gmail.com	2.300,00
8	JU OŠ "Čelić" Čelić	Tuzla Canton	Čelić	Alije Izetbegovića 61		+387 35 668 080 direktor@oscelic.edu.ba	2.461,00
9	JU "Prva osnovna škola Živinice"	Tuzla Canton	Živinice	Školska ulica bb	Asif Andelić, Direktor	+387 35 772 218	4.740,00

10	JU OŠ "Kalesija"		Tuzla Canton	Kalesija	Žrtava genocida u Srebrenici bb,		+387 35 610 080 os.kalesija@bih.net.ba	1.120,00
11	JZU Dom zdravlja Gradačac	Zgrada porodične medicine	Tuzla Canton	Gradačac	Josipa Šibera bb, Gradačac	Dr. Mirza Peštalić, zamjenik direktora	+387 35 367 000 info@odzgradacac.com	3.775,76
12	OŠ "Ćamil Sijarić" Nemila, Zenica	PŠ "Starina"	Zenica-Doboj Canton	Zenica	Starina bb	Ahmed Buljubašić, direktor	+ 387 32 465 000	130,03
13		PŠ "Kolići"		Zenica	Kolići bb			128,00
14		PŠ "Bistrica"		Zenica	Bistrica bb			90,00
15		PŠ "Orahovica"		Zenica	Orahovica bb			375,00
16		PŠ "Kovanići"		Zenica	Kovanići bb			110,00
17		PŠ "Šerići"		Zenica	Šerići bb			168,00
18	OŠ "Aleksa Šantić", Zenica	PŠ "Dvor Moščanica"	Zenica-Doboj Canton	Zenica	Moščanica bb	Pepić Džemail, direktor	+387 62 919-130 +387 32 465 033	320,00
19		PŠ "Dolača"		Zenica	Dolača bb			540,00
20	OŠ "Ahmet Muradbegović", Zenica	PŠ "Pojske"	Zenica-Doboj Canton	Zenica	Pojske bb	Fazlić Mirnas, direktor	+387 32 460 536	680,00
21		PŠ "Lokvine"		Zenica	Josipa Dačića bb			660,00
22	OŠ "Vladimir Nazor" Zenica	PŠ "Luke"	Zenica-Doboj Canton	Zenica	Sarajevska 20	Mirnes Varupa	+387 62 617 978	500,00
23	OŠ "Enver Čolaković", Zenica	PŠ "Lašva"	Zenica-Doboj Canton	Zenica	Lašva	Ibrahimagić Elvir, direktor	+387 32 465-006	705,00
24		PŠ "Gnjusi"		Zenica	Sarajevska 164			618,00
25	OŠ "Alija Nametak", Zenica	PŠ "Jezera"	Zenica-Doboj Canton	Zenica	Jezero bb -Zenica	Dedić Hatidža, direktorica	+387 32 465 029; mob. +387 61 161 247	250,00
26	"Druga osnovna škola" Zavidovići	PŠ "Dolina"	Zenica-Doboj Canton	Zavidovići	Ulica 8 marta bb	Admir Brčaninović, Direktor	+387 62 880 545	180,00

27	OŠ "Kovači" Zavidovići	PŠ "Brezik"	Zenica-Doboj Canton	Zavidovići	Kovači, Zavidovići	Midhat Mujanović	+387 62 343 441	300,00
28	OŠ "Gostović", Zavidovići	PŠ "Bajvati"	Zenica-Doboj Canton	Zavidovići	Bajvati, Čardak	Izet Muhić, direktor	+387 32 465 111	165,08
29		PŠ "Mahoje"		Zavidovići	Mahoje, Čardak			167,00
30		PŠ "Poljice"		Zavidovići	Poljice, Zavidovići			250,26
31	OŠ "Vožuća", Zavidovići	PŠ "Slivići"	Zenica-Doboj Canton	Zavidovići	Slivići bb. Vožuća	Jusuf Ahmetović, direktor	+387 61 983 399	300,00
32		PŠ "Ribnica"		Zavidovići	Ribnica bb. Vožuća			1.200,00
33	Dom zdravlja Ravno		HNŽ/K	Ravno	Ravno bb	Stana Burić, director	063 313 289	300,00
34	Dom zdravlja Neum		HNŽ/K	Neum	Zagrebačka 4b	Mario Matić, Stručni suradnik	036 880 073	1.272,00
35	Kulturni centar Stolac		HNŽ/K	Stolac	Humska b.b. Stolac	Tihomir Perić, pomoćnik Načelnika	036/819-019	707,00
36	Područna škola Svitava		HNŽ/K	Čapljina	Osnovna škola „Lipanske zore“ Višići, Područna škola Svitava, 88307	Director, Đuro Raguž	063 388 734	105,00
37	Područna škola Gubavica		HNŽ/K	Mostar	Gubavica bb	Dzermal Juko, direktor	061 467 129	390,00
38	DOM ZDRAVLJA ODŽAK		PŽ/K	Odžak	Titova bb	Franc Kljajić	+387 63 566 537	1.366,00
39	DOM ZDRAVLJA DOMALJEVAC- ŠAMAC		PŽ/K	Domaljevac - Šamac	104. HVO brigade 10	Franc Kljajić	+387 63 566 538	347,00
40	STARA BOLNICA		PŽ/K	Orašje	III ulica br.4, Orašje	Franc Kljajić	+387 63 566 539	1.200,00
41	PATOLOGIJA		PŽ/K	Orašje	III ulica br.4, Orašje	Franc Kljajić	+387 63 566 540	300,00

42	OŠ fra Ilije Starčevića Tolisa SPORTSKA DVORANA	PŽ/K	Tolisa	V. Nazora 192	Franc Kljajić	+387 63 566 541	227,00
43	OŠ Stjepana Radića u Boku Područna škola Oštra Luka	PŽ/K	Oštra Luka (Orašje)	Oštra Luka, Školska 18.	Franc Kljajić	+387 63 566 542	210,00
44	OŠ Stjepana Radića u Boku Područna škola Bok	PŽ/K	Bok (Orašje)	Bok, Domobranska bb	Franc Kljajić	+387 63 566 543	396,25
45	OŠ Vladimira Nazora Odžak (Aneks zgrada Centralne škole)	PŽ/K	Odžak	Odžak Nova ulica bb	Franc Kljajić	+387 63 566 544	123,28
46	OŠ Vladimira Nazora Odžak PŠ Donji Svilaj	PŽ/K	Odžak	Donji Svilaj bb	Franc Kljajić	+387 63 566 545	266,00
47	OŠ Vladimira Nazora Odžak PŠ Vrbovac	PŽ/K	Odžak	Vrbovac bb	Franc Kljajić	+387 63 566 546	124,00
48	OŠ Vladimira Nazora Odžak PŠ Gornja Dubica	PŽ/K	Odžak	Gornja Dubica bb	Franc Kljajić	+387 63 566 547	166,92

Annex 2 - Detailed Energy Audit study structure

1. INTRODUCTION

- 1.1 The purpose and objective of conducting an energy audit
- 1.2 Brief description of the client
- 1.3 Brief description of the location, use of the building and date of construction/reconstruction of building
- 1.4 Type of building and purpose
- 1.5 Brief description of the energy system
- 1.6 Brief description of the characteristic energy subsystems
- 1.7 Brief description of the comforts of staying in the building

2. ANALYSIS OF THE CURRENT STATE OF THE BUILDING; ENERGY CHARACTERISTICS OF THE BUILDING AND THERMO - TECHNICAL SYSTEMS

- 2.1 . Analysis of the thermal characteristics of the building envelope
- 2.2 . Analysis of the energy characteristics of the heating area
- 2.3 . Analysis of the energy characteristics of the cooling space system
- 2.4 . Analysis of the energy characteristics of ventilation and air-conditioning system
- 2.5 . Analysis of the energy properties of the preparation of domestic hot water system
- 2.6 . Analysis of the energy properties of the electric energy consumption system - electrical , lighting , appliances and other loads
- 2.7 . Analysis of the energy characteristics of specific subsystems (kitchen , laundry , etc.)
- 2.8 . Analysis of domestic water consumption
- 2.9. Analysis of the regulation and management system
- 2.10. Analysis of the energy properties of the system to produce thermal and electric energy from renewable energy sources (if they exist on the site)

3 ANALYSIS OF CONSUMPTION AND COST FOR ENERGY AND WATER

- 3.1 . Analysis of energy sources consumption
- 3.2 . Analysis of energy consumption
- 3.3 . Analysis of indicators of energy consumption and costs for energy and water (for minimum three years before energy audit)

4 CALCULATION OF THERMAL NEEDS OF THE BUILDING

- 4.1 . Calculation of thermal losses of the building
- 4.2 . Calculation of the needed thermal energy for a building

5 ANALYSIS AND SELECTION OF POSSIBLE MEASURES TO IMPROVE ENERGY CHARACTERISTICS OF BUILDINGS

- 5.1 . Review of the proposed measures to increase energy efficiency in the building (three scenarios)
- 5.2 . Description and analysis of the savings of proposed measures to increase energy efficiency in the building
- 5.3 . Scenarios of implementation of the proposed measures of energy efficiency

5.4 . Review optimal scenario of implementation of proposed measures

6. FINANCIAL ANALYSIS OF OPTIMAL SCENARIO INVESTEMENT

6.1 . Review the investment costs of the optimal scenario

6.2 . Financial analysis of the optimal scenario

7 COMPARATIVE ANALYSIS OF RELEVANT INDICATORS OF ELECTRIC CONSUMPTION AND THERMAL NEEDS OF THE BUILDING

7.1 . Indicators of energy consumption and thermal needs for the current state

7.2 . Indicators of energy consumption and thermal needs after the implementation of EE measures according to the optimal scenario

7.3 . Comparative analysis of indicators of energy consumption and thermal needs of the current situation and after the implementation of the optimal scenario

8. CLASSIFICATION OF BUILDING IN THE ENERGY CLASS ACCORDING TO THE REGULATION OF PERFORMING ENERGY AUDIT AND ISSUING ENERGY CERTIFICATES

9. FINAL REPORT ON ENERGY AUDIT WITH CONCLUSIONS AND RECOMENDATIONS

10. DIGITAL - FINAL REPORT OF ENERGY AUDIT – ANNEX 5 OF REGULATION, ON-LINE INPUT IN REGISTER OF ENERGY CERTFIFICATES IN FEDERAL MINISTRY OF PHYSICAL PLANNING

Annex 3 Summary of Detailed Energy Audit Report – Excel Form (SAMPLE)

No.	Object Name	Location	Canton	Area (m2)	Fuel (before)	Fuel (after)	Current Fuel Costs (BAM)
1	Elementary School Ivana fra Frane Jukica Sivsa	Usora	ZENICA DOBOJ	488	LFO	BIOMASS	25.997
Energy Consumption Before (kWh/year)	Investment with VAT (BAM)	Energy Savings (Fuel) (kWh/year)	Saving per 1 inv BAM (kWh/BAM)	Energy Savings (Money) (BAM/year)	Simple Pay Back Period (years)	Energy Consumption After (kWh/year)	EE measures
185.492	37.560	123.517	2,96	28.266	1,3	37.312	Optimal Scenario (3): 1. Biomass boiler installation; 2. Facade thermal insultaion; 3. Attic floor thermal insulation; 4. Incandescent light bulbs replacement; 5. Motion sensor installation; 6. Daylight sensor installation.

Number of users	Share female users	Indoor temperature	Baseline heating consumption (QHnd)	Baseline electricity consumption	Baseline energy consumption total	Heating system efficiency coefficient before	Energy class BEFORE	EE measures	Non-EE measures	Total investments (EE+non EE) (source DEA)
	%	(C)	kWh/a	kWh/a	kWh/a	%		€	€	€

Energy consumption after retrofit (planned) (QHnd)	Electricity consumption after retrofit (planned)	Fuel for heating (After)	Heating system efficiency coefficient after	Thermal energy savings	Total energy savings (Thermal and electrical)	Energy class AFTER	Cash savings	CO2 savings
kWh/a	kWh/a	Type	%	(kWh/a)	kWh/a		€/a	metric ton (CO2/a)