

Terms of Reference (TOR)
Energy Audit of Demonstration Buildings
for the Project:
“Policy Reforms and Market Transformation of the Energy Efficient Buildings
Sector of the I.R. Iran”

Title:	Energy Audit for Demonstration Buildings
Project (Short Title):	Energy Efficiency and Environment in Buildings (EEEB)
Location	Tehran
Application Deadline:	15 August 2018
Type of Contract:	Service Contract
Languages Required:	Persian and English
Expected Workload:	4 Man-month per one batch of 5 buildings

Date of Advertisement: 26th of July 2018 - 15th of August 2018

Interested Companies should directly send their Company profile and references/CV, cover letter, Technical and Financial Proposal in closed envelopes to the Project Central Office:

- Address: No. 28, Attar Street, Valiasr Street, Vanak Square, Tehran, Iran.
- Website: eeeb.ceee.isti.ir
- Tel.: +98(21)40884905 [# 5106]

Background

The objective of the EEEB project is to transform the energy efficiency in buildings in Iran, resulting in an invigorated sector in which skilled and well trained engineers fit / retrofit efficient and low carbon heating systems in residences and other buildings, as required by demanding, well enforced building codes - thereby reducing energy bills for residents and national GHG emissions. It is envisaged that this will be achieved by (i) reviewing the legislative, policy and regulatory frameworks that impact building efficiency in Iran; revisiting the building code and products standards and labels and developing a supportive cross-sectoral energy efficiency strategy; enhancing professional infrastructure of energy service business through contributing to the development of a training system and smart maintenance of energy utility in buildings (ii) developing demonstration and pilot smart energy efficiency and environment building based on

energy efficient and renewable energy measures in an existing demonstration building; implementing pilot project of hybrid energy efficiency system (hybrid of fossil and renewable energy sources) in specific and selected buildings, piloting of energy service business in the framework of market transformation, and (iii) transforming the market by: introducing mechanisms of competitive energy efficiency and environment market, utilization of sectoral and temporal energy price differentials, facilitating trade of white certificates (energy efficiency and environment), developing policy framework for promoting energy service and energy efficiency business, identifying and formulating mechanisms for promoting development and diffusion of energy efficient technologies, preparing procedures for developing infrastructures for training energy service professionals and issuing professional certificates, developing a system of quality assurance of energy efficiency and environmental quality services in the building sector, developing a stakeholder awareness-raising campaign and developing proposals for financing mechanisms for households.

The project will operate through three main components:

- Component 1** Key laws, policies, strategies, regulatory documents, frameworks and studies are proposed and in place to provide overall national direction for the cost-effective CO₂ mitigation/building EEE measures and facilitation of cross-sectoral coordination and coherence for improved enforcement of building energy code.
- Component 2** Improved heating systems and integration of SWH systems in privately owned residential buildings and government-owned buildings demonstrated through implementation of 200 pilot projects
- Component 3** MEEE promoting ESCOs to nationwide transformation of construction techniques for a thermally insulated building shell and reduced heating loads as well as improved behavior and attitude of building owners and administrators towards energy use in buildings

The component 1 will provide conducive legal framework and set minimum technical requirements for energy performance of buildings. It will also develop and establish a compliance enforcement system for buildings energy code based on building 'energy passport' or 'energy performance certificates'¹, and supported by reference laboratory for testing the materials and equipment efficiencies. It will also provide a legal and institutional framework for market for

¹ Building's Energy Passport (BEP) or buildings Energy Performance Certificate (EPC) are documents produced by accredited parties clearly declaring whether or not a building complies with building energy code requirements

energy efficiency and environment market (MEEE) where ‘white certificates’² will be traded. The key supportive tool for compliance enforcement and EEE market operation will be developed as well as a web-based IT platform referred to as ‘Energy Management Information System’ (EMIS).

The component 2 will develop and test operational procedures for implementing building improvements through application of appropriate technologies, production of white certificates, operationalization of EMIS, development and implementation of measurement and verification (M&V) procedures, and along with building capacity of all involved stakeholders and created a training program for rolling out the capacity building required for MEEE operation and EE market transformation.

The component 3 will among the other outcomes develop and run a multi –year multi-channel public media promotion and awareness campaign aiming at changing attitude towards energy use and creating motivation for improving energy efficiency by the public at large at their homes and places of work.

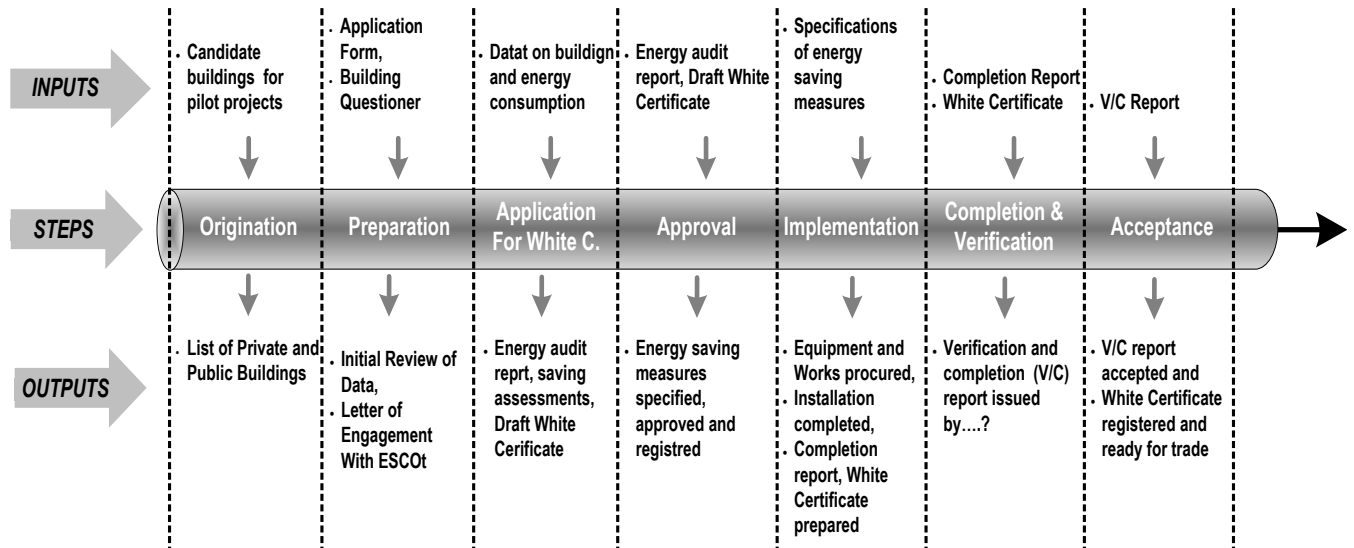
The Project management unit (PMU) has been established with overall project management and implementation responsibilities under the leadership of National Project Manager (NPM) and supervision of National Project Director (NPD).

Within this framework, the UNDP - PMU seeks services of 2 companies who will coordinate and provide Energy Audits for 2 packages (Annex 1) of 10 selected buildings – each package has 5 selected buildings and each company can apply for one package.

Purpose of Energy audits

Within the Component 2 of the EEEB project a system of White certificates will be introduced, where individual energy renovation of building projects will be developed as described in the next figure leading towards issuing of White Certificates for direct and indirect (electricity) annual gas savings over the period of 5 years. Investment grade energy audits will have an important role in definition of building renovation assessment of savings which are bases for White Certificates formulation.

² White certificates are tradeable documents which are based on confirmed and certified energy savings achieved at certain energy users and then sold on the Iran energy exchange to interested buyers



Therefore, the main purpose of produced energy audit reports is to support the overall process of issuing White Certificates and give adequate input bases for further steps:

- specification of investments cost into standardized energy savings measures through detailed design,
- proposing measurement and verification method and approach for confirming achieved savings through implemented EE measures over the period of 5 years.

Standard EE-RES solutions to be analyzed

The standard EE and RES measures do include, but shall not be limited to, the following energy efficiency and renewable energy sources measure types:

Building Envelope improvements

Insulation of walls, roof, floor

Replacement of windows/doors or repair (weather stripping, improved glass panes, fixtures) and shading

Technical systems

Heating systems – upgrade and replacement of gas boilers, hot water distribution and controls

Cooling systems – upgrade and replacement of chillers and controls

Waste heat recovery

Combined Cooling, Heating and Power (CCHP) or Combined Heating and Power (CHP) systems

Heat pumps

Renewable energy - Solar thermal panels, Solar photovoltaic panels

Electrical systems

Lighting -LED lighting with sensors and controls, use of daylight

Efficient electrical equipment and appliances

Energy Management

Energy smart metering, maintenance and operation

Smart building management systems.

Scope of Work

Within the project framework, PMU seeks services of two Companies/ two Consortium who will coordinate and provide Energy Audits for selected buildings. There are two packages/lots of energy audit works. The task of this assignment is to perform Investment Grade Energy Audits (IGEA) on two groups of five (5) selected buildings (the information is attached in the Annex 1) each located in Tehran during August to November 2018 in order to identify the current status of energy performance of the selected buildings and advise on applicable potential cost-efficient measures from the list of standard EE-RES solutions to improve EE of gas and electricity use, and to calculate equivalent gas saving amount on annual basis, which will be the basis for issuing the White Certificates (WC).

Methodology

The companies will report to the NPM and will work closely with the EEEB project team. The methodology requires a clear focus on the objective of improving overall energy utilization. This will be achieved through coordination with stakeholders, document review, facility inspection, utility analysis, economic analysis, data collection, desk research, interviews, meetings, report writing and workshops with relevant stakeholders, and discussions with relevant ministries, relevant agencies and state governments.

Investment Grade Energy Audit

Investment grade energy audit includes a 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, heat losses, 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 an investment grade energy audit are:

- Meet and talk with key people in the building - the manager and the users / owners
- Review of existing project documentation (in case no documentation is available the company shall measure building envelope and produce corresponding drawings)
- Review and analyze the accounts with data on thermal and electric energy consumption and water for optimal 36 months
- Tour and detailed 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
- 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. For the purpose of formulating White Certificates, the direct and indirect (for instance through saving of electric energy) saving of gas has to be calculated on a yearly bases and verification baseline and procedure has to be defined
- Preparation of the report with conclusions and recommendations for submission to EEEB and the building owner, as well as presentations to key people.

Investment Grade Energy Audit Report should have content and a structure specified in the Annex 2.

Expected Outputs

Corresponding to the scope of work, the companies are expected to produce:

- Five investment grade energy audit reports of the building to review and analyse existing characteristics of each building. The report must provide a description of the methodology employed, equipment used, calculations, charts, findings and recommendations.

The Report shall provide a solid basis further steps in the formulation and verification of White Certificates:

- For the architects and designers to enable them to produce design of the energy efficiency measures with detailed technical specifications and Bills of Quantities. Based on the Report, design has to be produced including design details ensuring long lasting effect by addressing identified problems such as (e.g. leaking roof, loose plaster, wiring problems etc.) and need for retrofit/ repair of certain building part or equipment (e.g. broken window glass or defect window fixtures);
 - And for verification of archived effects of energy efficiency renovation measures.
- A Final report with conclusions and recommendations based on the findings of individual building energy audits and preparation of investment grade energy audit reports.

All Reports shall be submitted in three (3) hard copies and one (1) electronic copy (PDF) and with calculations in Excel or other format. All documents prepared by the company should be in English and in Persian.

Duration

The consultancy is expected to take place from August 2018 to November 2018.

Deliverables and Timeline

The companies will be responsible for the delivery, content, technical quality and accuracy of the reviews and reports. All deliverables shall be submitted to EEEB Project Management Unit (PMU).

Terms of Payment

The fee is payable upon satisfactory completion and acceptance of the deliverables by Project Management Unit (PMU). Breakdown of deliverables and percentage is given below.

Activity	Percentage	Delivery Time	Lump Sum
Upon contract signing and agreement of workplan with project team	5%	30 August 2018	
Mobilizing of measurement and monitoring equipment on site	5% for each site	20 September 2018	
Five (5) IGEA report(s) of the building	10% for each report	22 October 2018	
Final report	5%	3 November 2018	
Approval (Timely and satisfactory performance)	15%	13 November 2018	
Total	100%		

Note:

- Prices should be in Rials and include all expenses (including local travels, staffing and equipment)
- The companies are responsible for payment of all relevant taxes.
- The PMU will not provide any equipment and technicians in executing the audit measurements. It is expected that the companies to sufficiently resource itself in carrying out the audit work (where it shall be included in the Financial Proposal).

Competencies

Corporate Competencies:

- Demonstrates integrity by modelling the UN's values and ethical standards
- Promotes the vision, mission, and strategic goals of EEEB project, and partner organizations
- Displays cultural, gender and age sensitivity and adaptability

Functional Competencies:

- Excellent knowledge of energy efficiency

- Demonstrates strong analytical skills
- Promotes team work, contributes towards building team consensus
- Builds strong relationships with clients, focuses on impact and result for the client and responds positively to feedback
- Consistently approaches work with energy and a positive, constructive attitude,
- Excellent teamwork and leadership skills,

Development and Operational Effectiveness:

- Ability to analyze technical requirements in energy efficiency and energy management applications
- Ability to apply organizational policies and procedures,
- Strong analytical skills.

Management and Leadership:

- Focuses on impact and result for the client and responds positively to feedback
- Supports teams effectively and shows conflict resolution skill
- Consistently approaches work with energy and a positive, constructive attitude
- Demonstrates strong oral and written communication skills
- Builds strong relationships with clients and external actors
- Demonstrates openness to change and ability to manage complexities.

Expertise and Experience Required

The companies should ideally have the following expertise and experience:

Professional Experience

- Minimum 5 years of relevant professional experience in energy audit (International experience will be an advantage).
- Knowledgeable in energy policies, regulations and energy management procedures of Iran will be an advantage
- Experience with the ESCO business models (energy analysis and audits, energy management, project design and implementation, maintenance and operation, monitoring and evaluation of savings, property/facility management, energy and/or equipment supply, provision of service) will be an advantage

- Experience with a facilities management company models will be an advantage
- Experience with energy management projects for Government institutions in Iran will be an advantage

Key personnel

- At least two university graduate mechanical engineers or related fields, with minimum five (5) years' experience
- At least four (4) additional staff members, from which one should be economist that will be engaged to this project (e.g. architect, civil engineers, electro engineers etc.), with minimum three (3) years' experience
- Engineers have to have a minimum of two years of consultancy experience in the field of energy efficiency,

Documents to be included when submitting the proposals:

Interested companies must submit the following documents/information to demonstrate their qualifications:

1. Proposal on how the company's qualifications and experiences can lead towards the successful deliverable of this assignment within the required timeframe, and provide a brief methodology on how the company will approach and conduct the assignment
2. Financial Proposal as provided. Alternatives are allowed
3. Organizational structure of audit team and the personal CVs including areas of expertise and past experience in similar projects and at least three (3) references.

Note 1: Please save and upload all documents and proposals into one PDF file.

Note 2: Please note that any bidder can bid for both lots, but could be awarded a contract just for one lot (5 buildings) only.

Annex 1: List of selected buildings (Lot A and Lot B)

Lot A:

Code	Type of Building	City
A-1	Residential	Tehran
A-2	Office	Tehran
A-3	Training	Tehran
A-4	Infirmary/clinic	Tehran
A-5	Bank	Tehran

Lot B:

Code	Type of Building	City
B-1	Residential	Tehran
B-2	Office	Tehran
B-3	Training	Tehran
B-4	Infirmary/clinic	Tehran
B-5	Bank	Tehran

- **Note:** The companies can visit the buildings before submitting the financial proposals. Please contact to Mr. Bagheri, Tel. +98(21)40884905 or +98(911)7127383 for more information.
- Please note that any bidder can bid for both lots, but could be awarded a contract just for one lot (5 buildings) only.

Annex 2: Investment Grade Energy Audit Report structure

1. INTRODUCTION

- 1.1 The purpose and objective of conducting an energy audit
- 1.2 Brief description of the client, contact data
- 1.3 Brief description of the location and use of the building
- 1.4 Brief description of the energy system
- 1.5 Brief description of the characteristic energy subsystems
- 1.6 Brief description of the thermal comfort conditions

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

- 2.1 Building location and layout, general construction description
- 2.2 Analysis of the thermal characteristics of the building envelope (wall, windows and external doors, floor and roof)
- 2.3 Analysis of the energy characteristics of the heating system with hot water distribution
- 2.4 Analysis of the energy characteristics of the cooling system
- 2.5 Analysis of the energy characteristics of ventilation and air-conditioning system
- 2.6 Analysis of the energy properties of the preparation of domestic hot water system, distribution and consumption
- 2.7 Analysis of the energy properties of Lighting system (indoor and outdoor, operating schedules, zoning, lux levels, power densities)
- 2.8 Analysis of the energy properties of other electric energy consumption system – HVAC systems, appliances and other loads
- 2.9 Analysis of the energy characteristics of specific subsystems (kitchen, laundry, etc, if they exist)
- 2.10 Analysis of the building automation system and management system (operational procedures, maintenance, staff training, etc)
- 2.11 Analysis of the energy properties of the system to produce thermal and electric energy from renewable energy sources (if they exist on the site)
- 2.12 Analysis of water supply and consumption

3. ANALYSIS OF CONSUMPTION AND COST FOR ENERGY AND WATER

- 3.1 Analysis of energy sources consumption and cost (fuels sources, utility bills, tariffs imposed, etc)
 - 3.2 Analysis of water consumption and cost
 - 3.3 Analysis of indicators of consumption for energy and water
4. CALCULATION OF ENERGY CONSUMPTION
- 4.1 Calculation of energy for heating and cooling
 - 4.2 Calculation of energy for domestic hot water preparation
 - 4.3 Calculation of electrical energy consumption
5. ENERGY EFFICIENCY MEASURES
- 5.1 Renovation measures to increase energy efficiency in the building with: investment costs, design cost, installation cost, lifetime, maintenance estimate, etc
 - 5.2 Description and analysis of the savings (related to energy consumption before measures) of proposed measures in: energy, cost, GHG emission and converted to natural gas saving
 - 5.3 Scenarios of implementation of the proposed measures with feasibility analysis with NPV, IRR and simple pay-back (calculation parameters will be provided by the EEEB project)
 - 5.4 Selection of optimal scenario of implementation of proposed measures
6. ADDITIONAL MEASURES
- 6.1 Measures related to Energy management (metering, EMS, etc)
 - 6.2 Additional building renovation measures (building structure, fire safety, health hazard, etc)
7. COMPARISON OF RELEVANT INDICATORS
- 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. IMPLEMENTATION ARRANGEMENTS
- 8.1 Establish a baseline for measurement and verification of energy savings achieved

8.2 Plan for Implementation of the proposed measures

9. FINAL REPORT ON ENERGY AUDIT WITH CONCLUSIONS AND RECOMENDATIONS

Annex 1: Calculation assumptions and methods

Annex 2: Calculation results

Annex 3: Reports of conducted metering and measurements