REPUBLIC OF TURKIYE
MINISTRY OF ENVIRONMENT, URBANIZATION AND CLIMATE CHANGE

General Directorate of Construction Affairs (GDCA)

TÜRKİYE ENERGY EFFICIENCY IN PUBLIC BUILDINGS PROJECT

(P162762)

TERMS OF REFERENCE (TOR) FOR

Consultancy for Data Analysis and Measurement and Verification (REF: EEPB/WB/MOEU/CQS-CS-01)

1. Background and Information

The Government of Türkiye has received financing from the World Bank to implement the Energy Efficiency in Public Buildings Project (EEPB). The Project's objectives are to reduce energy use in central government buildings and inform the development of sustainable financing mechanisms to support a scaled-up, national program for energy efficiency (EE) in public buildings.

About US$200 million has been provided by the World Bank—US$150 million IBRD loan, US$46.2 million CTF concessional loan, US$3.8 million CTF grant to support the renovation of central government and central-government affiliated buildings (i.e., public buildings under central line ministries, such a schools and hospitals). It is expected that such subprojects will generate demonstrable energy cost savings and social co-benefits, which would form the basis for developing a national-level program for EE in public buildings. As the proposed projects aims to renovate public buildings with the highest energy consumption, the immediate direct beneficiaries are the public sector that benefits from budgetary savings from the investments and users of the public buildings (administrative staff and society) and public communities in the catchment areas of the identified facilities.

Investments include building envelope measures (roofs/wall insulation, windows, doors), heating/cooling systems, water heating, pumps/fans and lighting and some renewable energy (RE) applications (e.g., rooftop solar PV, biomass heating, solar water heating, geothermal heat pumps) to offset the building's electricity/fuel use. A limited amount of funds may be allocated for non-EE/RE measures (e.g., rewiring, minor structural repairs, painting, etc.).

The General Directorate of Construction Affairs (GDCA) under the Ministry for Environment and Urbanization and Climate Change (MoEUCC) has been delegated to assume overall responsibility for the Project. MoEUCC established a project implementation unit (PIU) to administer all aspects of the Project. The PIU is responsible for selection of the buildings, procurement of the various contractors (e.g. energy audits, technical designs, renovation works, construction supervision, measurement and verification of savings, technical assistance or TA consultancies, etc.) and overall Project management.

The project was effective in March 2020 and since the project effectiveness;

- 12 consultancy service contracts have been signed to prepare the investment grade energy audit reports, technical drawings and bidding documents and carry out construction supervision for 565 buildings.
- The renovation works contracts for 330 buildings have been signed.
- The renovation works of 99 buildings have been completed and commissioned to date and the remaining that have been contracted will be completed by the end of 2024.
- The measurement and verification (M&V) reports of 36 buildings over a one-year measurement period have been completed.

Within the framework of the EEPB, a Consulting Company (Consultant) will be employed to provide technical assistance for analyzing public building renovations carried out by MoEUCC GDCA, hereafter referred to as the Client.

The objectives of the assignment are to help the PIU within MoEUCC's GDCA to input, track, analyze and verify the impacts of the buildings renovated under the Project.

2. Scope of Work

A consulting company (Consultant) will be hired to assist the PIU to analyze building renovation data under the Project. In order to carry out this assignment, the following tasks will be required.

Task 1. Inception meetings

As a first step, the Consultant will meet with the PIU to understand the databases of building renovations they already have, specific needs for data input spreadsheets, required parameters in the tracking sheets, types of analyses to be done under Task 3, sample of buildings for the M&V task and methodologies for the assignment. The Consultant will prepare an Inception Report summarizing its approach to the assignment, types of analyses to be done and methodologies and submit it to the PIU for review and approval.

Deliverable: Inception report

Task 2. Prepare building renovation input and tracking spreadsheets

The Consultant will then prepare a set of spreadsheets to help input and track the buildings renovated under the Project. This will include development of a data input sheet template which will assist the PIU to ensure all the relevant information from the energy audit report are properly entered consistently and organized.

A preliminary list of data would include:

- Basic facility data: e.g., facility name, facility type, number of buildings in the facility, location, number of building users, construction year, floor area, original EPC level, etc.
- Energy audit data: e.g., baseline energy data and fuels, main energy efficiency measures and costs/payback periods, estimated energy/CO_2/cost savings, estimated energy savings by energy/fuel type, etc.

- M&V plan data: e.g., baseline energy data and fuels, main energy efficiency measures and costs/payback periods, estimated energy/CO_2/cost savings, energy savings by energy/fuel type, adjustments for underheating/cooling and changes in operating conditions, etc.
- Revised energy audit and M&V plan and commissioning plan (if needed)
- Commissioning and performance test: The results of the commissioning report, including the equipment operation and performance test, should also be included in the data input template.
- M&V report: After 1-year of M&V, the impacts of the renovation will be included in the report template. This would include information collected from the energy management system that is established in each renovated building to monitor the savings and electric generation.
- Final energy use and savings, CO_2 and cost savings, MW and GWh of RE generated, reduction in fossil fuel use, etc.

The input tables would then be linked to a Project tracking spreadsheet which would pull key project data from the input sheets to a master tracking table which would provide a summary of all the buildings renovated under the Project and those that will be renovated in the future. The tracking table would include a line for each building, all the key indicators, and other relevant information which would be used in Task 3 for detailed analyses. The tracking spreadsheet could also be used to facilitate project reporting, development of case studies, preparation of communication materials, etc.

Draft input and tracking sheets will be shared with the PIU for review before being finalized. Once final, the Consultant will collect the information from the PIU from its existing databases, energy audit, commissioning and M&V reports, and other documents. Then the Consultant will populate the input sheets and tracking table based on the data collected.

Deliverable: Data input sheet and portfolio tracking spreadsheet
Fully populated input and tracking spreadsheets

Task 3. Analyze data from the developed tracking sheet

The Consultant will then analyze the data in the tracking sheet based on the Inception Plan approved by the PIU. The analyses will help summarize the impact of the buildings renovated, identify potential outliers in the portfolio, assess future investment costs, identify common themes (such as differences in energy savings from audits and M&V reports), and inform future renovations (such as future technical requirements, minimum required EPC Class levels, incremental costs to get from Class C to B, Class B to A, Class A to NZEB, etc.). Pivot tables or other with template tables/charts should be part of the tracking sheet to enable the PIU to continue analyses after the assignment. At a minimum, the analyses are expected to include:

- Energy savings:

- Average energy savings for the renovated facilities (kWh/building, kWh/m^2, %), broken down by building type (e.g., hospitals, schools, dormitories, administrative buildings);
- Average cost of energy savings (TRY/kWh, TRY/m^2, USD/kWh, USD/m^2), by building type;
- Average cost to increase EPC classes (e.g., from Class D to Class C or B, NZEB), broken down by building type;
- Average installation of renewable energy (RE) (MW/building, MW/m^2, TRY/MW)
- Average RE generation (kWh/m^2 and % of the building's average energy consumption)

- Financial data:
  - Average investment costs (TRY/building, TRY/m^2, USD/building, USD/m^2), broken down by building type, region;
  - Average payback period/IRR/NPV
- Environmental data:
  - Average cost of CO_2 emissions reduction (TRY/kg CO_2, USD/kg CO_2) by building type;
  - Total and average reduction in fossil fuel use (MJ)

The Consultant will prepare a portfolio analysis report summarizing the analyses and main findings, along with recommendations for future renovations based on the analyses.

Deliverable: Portfolio analysis report

Task 4. Review energy savings methods and develop M&V input data sheets

The Consultant will analyze the results from the building renovations of at least 10 facilities in different cities, to be agreed with the PIU, representing the climate regions in TS 825 Thermal Insulation Requirements for Buildings[1] and different buildings types such as schools, university campuses, hospitals, administration buildings, dormitories, to determine the robustness of the analyses and reported results. This could include reviewing the energy audit reports, detailed designs, revisions to the audit reports, M&V plans, commissioning and acceptance reports, performance tests, M&V reports and independently verify the robustness of the energy consumption baseline, why changes were made, adjusted baseline and conclusions on the final energy savings. In the review, the Consultant should also assess the costs to have gone further in the renovations, such as more insulation, deeper renovations, greater use of heat pumps and other measures to reduce fossil fuel use/CO_2 emissions, achieve higher EPC Classes or NZEB standards. As deficiencies are identified, the Consultant will make specific recommendations to improve the accuracy and robustness of the reporting and analyses going forward.

The Consultant will also prepare an M&V input sheet, to assist the PIU to track the impacts of the renovations consistently and systematically. This would include entering more granular data from the

[1]https://www.mevzuat.gov.tr/anasayfa/MevzuatFihristDetayIframe?MevzuatTur=9&MevzuatNo=12390&MevzuatTertip=5

energy audits (e.g., baseline data, operating conditions, underheating/undercooling, measures to be implemented, investment cost, estimated savings, estimated IRR), revised energy audits, M&V plan, adjustments to the baseline, performance test and M&V reports. This data would be linked to a calculation sheet to help the PIU more easily analyze the actual savings from each renovation.

Deliverable: M&V analysis report and M&V input sheet

Task 5. Conduct an independent review of the energy audit, M&V plan, performance test and M&V report for a University

In 2024, the PIU plans to implement a renovation of the Boğaziçi Üniversitesi Hisar and Kuzey Kampüsü in Istanbul under a simplified energy performance contract. The renovation works are expected to be completed by the end of 2024. Therefore, the Consultant will be required to serve as an independent reviewer of the commissioning and post-renovation performance test in order to advise the PIU whether the Contractor savings target had been achieved. The Consultant will review the final energy audit, technical design, any adjustments to the audit and design, the commissioning and acceptance report and the performance test results to determine whether or not the energy savings had been met. While the construction supervisor will be tasked with preparing the M&V plan and performance test, the Consultant will be required to conduct a detailed review of these outputs and provide an independent report to verify the findings. The Consultant should also review at least one quarter of M&V data from the M&V period (if the renovations works are completed by October 31, 2024). As needed, the Consultant may also be asked to advise the construction supervisor on any revisions needed on their reporting to improve the robustness of the estimations and accuracy of the results.

Deliverable List: Independent review of Boğaziçi Üniversitesi Hisar and Kuzey Kampüsü energy savings reports

3. Timing, Deliverables and Reporting Requirements

The period of implementation of the contract will be 8 months from contract date. The deliverables for each task will be submitted to and approved by the Client. The reports must be prepared in English and Turkish. The reports must be submitted both in hard copy and in electronic version (readable by a Microsoft Office application). The Turkish version of the reports should be prepared after the approval of the English version. The Consultant must obtain approval for each deliverable before moving to subsequent tasks. The Client shall give a decision within 15 days of receipt of a review or approval request. The deadlines for the submission of the deliverables (including Client's review and approval durations) are given below.

The contractor shall organize a half-day workshop at MoEUCC's premises to present the reports of each output of all components.

Table 1: Deliverable List:

Number	Name of report	Time of submission
1	Inception Report	1st month
2	Data input sheet and portfolio tracking spreadsheet	2nd month
3	Fully populated input and tracking spreadsheets	3rd month
4	Portfolio analysis report	4th month
5	M&V analysis report and M&V input sheet	6th month
6	Independent review of Boğaziçi Üniversitesi Hisar and Kuzey Kampüsü energy savings reports	7th month
7	Final Report	8th month

4. Facilities provided by the Consultant

The Consultant must ensure that its professional staff has adequate support and equipment. All costs for equipment and administrative and logistic support must be covered by the Consultant and included in the bid price, including:

- All costs arising from the activities of its staff during the contract period, including accommodation, allowances, transportation, insurance, etc.
- Automotive, equipment, equipment for field and lab tests, office supplies, hardware and software,
- All communication costs, including fax, email, telephone, etc.
- All the equipment, instruments, services and logistical support required for the implementation of the contract, and any costs incurred during its preparation of documents and drafts, copying, printing, qualified translation, interpretation etc.
- Technical equipment at the monitoring site.

5. Consultant's Qualifications and Team Composition

The Consultant will be selected by MoEUCC GDCA in accordance with the World Bank Procurement Regulations for IPF Borrowers, dated July 2016, Revised November 2017 and August 2018. The firm must propose a team capable of carrying out all aspects of the TOR. All experts must be independent and free from conflicts of interest in the responsibilities they take on.

The Consultant firm should;

(i) be in the consulting business for not less than the last 10 years prior to deadline for submission of interests,

(ii) have at least 5 years of experience relevant to the assignment in providing similar services under contracts of comparable size prior to deadline for submission of interests such as;
   a. preparing analysis study of energy audit reports,
   b. experience in preparation of M&V reports in accordance with IPMVP,
   c. and analysis of EE data, energy savings, study of EE potential of buildings,
   d. Preparing the data input sheet and portfolio tracking spreadsheets,

(iii) experience in projects financed by IFIs such as World Bank, etc. is an asset.

The working language of the Project is English. All the team members assigned by the Consultant must possess proficiency in English language. Day-to-day communication language will be Turkish or English at the field level to ensure smooth communication among all participants, direct and indirect, of the Project.

All key staff and support staff shall be mobilized immediately after the contract signature. Some travel to Istanbul in support of Task 5 will be needed, if the Consultant is based elsewhere.

Additional team members / non-key experts will be required for performing stated activities. The Consultant shall secure the proper implementation by recruiting satisfactory number of key/non-key experts in the field.

The Consultant must propose a team capable of carrying out all aspects of the ToR, including minimum the following but not limited to:

Table 2: Key staff's qualifications shall include but not limited to the following:

[N°] – Position and No. of expert	Required Experience
[K-1] - Team Leader (1):	The Team Leader should possess at least master's degree in engineering, economics, finance or related field and have At least fifteen (15) years of professional experience which includes: ○ Professional experience of minimum ten (10) years in the energy efficiency sector ○ Five (5) years of this experience in a managerial/team leader position. ○ Minimum seven (7) years of this experience shall be sought in the following areas: - Conducting energy efficiency audits in buildings, - Preparation of energy efficiency audit report/s - Preparation of M&V plan/s in accordance with IPMVP - M&V of energy savings and reporting - Development of EnBs and EnPIs - Adjustment and normalization of EnB and EnPI - Expertise on ISO 50.001, ISO 50.002 and ISO 50.006

[N°] – Position and No. of expert	Required Experience
[K-2] – Senior Measurement & Verification Expert (1)	The Senior M&V expert should be an international expert or local expert with international experience. He/she should possess at least master's degree in engineering, economics, finance or related field and have at least ten (10) years of professional experience, including: o with at least five (5) years of this professional experience in the energy efficiency sector as Certified Measurement and Verification (M&V) Expert o Minimum five (5) years of this experience shall be sought in the following areas: - Conducting energy efficiency audits in buildings, - Preparation of energy efficiency audit report/s - Preparation of M&V plan/s in accordance with IPMVP - M&V of energy savings and reporting - Development of EnBs and EnPIs - Adjustment and normalization of EnB and EnPI - Expertise on ISO 50.001, ISO 50.002 and ISO 50.006
[K-3] – Junior Measurement & Verification Expert (1)	The Junior M&V expert should possess at least master's degree in engineering, economics, finance or related field and have At least seven (7) years of professional experience, including: o with at least three (3) years of this professional experience in the energy efficiency sector as Certified Measurement and Verification (M&V) Expert o Minimum three (3) years of this experience shall be sought in the following areas: - Conducting energy efficiency audits in buildings, - Preparation of energy efficiency audit report/s - Preparation of M&V plan/s in accordance with IPMVP - M&V of energy savings and reporting - Development of EnBs and EnPIs - Adjustment and normalization of EnB and EnPI - Expertise on ISO 50.001, ISO 50.002 and ISO 50.006
[K-4] – Data analysts (2)	At least Master's degree in engineering, economics, finance or related field with at least five (5) years of professional experience, including in developing Excel input, tracking and analytical tables.