

Terms of Reference (TOR)

for Study on Energy Auditing and Efficiency Improvement Procedures for Power Plants and Assessment of cogeneration potential in the Industrial Sector

1. Project Background

Electricity plays a pivotal role for the socio-economic development of a country. In the recent years Bangladesh has experienced booming economic growth, rapid urbanization and increased industrialization. Hon'ble Prime Minister has announced the 'Vision 2021' which encompasses the target of ensuring affordable and quality energy supply for all. The Government of Bangladesh (GOB) has taken immediate, short, medium and long term power generation plans in order to fulfil the vision and commitment of the government.

In order to achieve the goal set by the government and attain the Sustainable Development Goals, power system of Bangladesh needs to be strengthened. GOB has been considering improving the overall performance of the power plants. Efficiency improvement of the power system will not only provide electricity to all the people of the country, but also accelerate the economic growth.

The study will prepare to establish the energy auditing and efficiency improvement procedures for power plants and assess the potentiality of cogeneration in power sector. Therefore, for meeting the above purposes, Power Division, Ministry of Power, Energy and Mineral Resources intends to appoint Consulting firm to Study on Energy Auditing and Efficiency Improvement Procedures for Power Plants and Assessment of cogeneration potential in the Industrial Sector. The study will be carried out under Bangladesh Power Sector Development and Capacity Building (BPSDCB) Project of Power Division. The project expenditure will be borne from the fund of the Asian Development Bank.

2. Purpose of the Assignment

The main objectives of this assignment are:

- a) Promote energy efficiency in power plants.
- b) Establish an energy auditing and efficiency improvement procedure for power plants.
- c) Promote cogeneration in industrial sector.

3. Duration and Location of the Services

The duration of the assignment will be 6 (Six) months. The location of service will be in Bangladesh.

4. Scope of Services

As mandated by the Bangladesh Energy Regulatory Commission (BERC) Act- 2003, BERC requires ensuring power plants operate at optimum efficiency, and that opportunities to improve efficiency are initiated through a systematic regulatory process. A systematic approach is required to ensure that energy efficiency in both GOB's own power plants and IPPs are regularly monitored, opportunities to improve efficiency are followed through to implementation.

The consultant will review the reported energy efficiency of all power plants in Bangladesh in relation to the power plant vintage, generating technology, and fuel used, and investigates opportunities to improve efficiency through no-cost and low-cost methods. For three power plants hubs of distinctly different technology/fuel combinations selected by Power Division, the

consultant will conduct heat rate testing using internationally accepted methodologies using the required calibrated instruments. The consultant will conduct a comprehensive energy audit (a level 3 energy audit) for each one of the three power plant hubs, to clearly identify efficiency improvement opportunities including retrofits for heat recovery/combined heat and power applications, where relevant. Each energy audit report should provide clear identification of no-cost, low-cost, and capital intensive projects, to improve efficiency. The consultant will develop a procedure, required forms and formats of reports, to enable Power Division to subsequently replicate the work done at the three power plant hubs to all power plants.

The scope of services includes the followings (including modifications proposed by the consultant, if any) in the scopes of work to meet the objectives of the assignments:

- a) Inspection of all units of 8 (eight) power plants (two coal based, two gas based, two oil based, one hydro based, one dual fuel based) review of the station logbooks and other available records to establish main reasons for the energy auditing of the plants. The consultant will examine such records of preventive maintenance including use of spare parts, duration of planned outage etc. Interviews and discussions with the plant managers/operators to determine the reasons for poor performance.
- b) Formulate a Framework Process of Energy Auditing in power plants.
- c) Carrying audit of equipment/machinery for comparison of the operating efficiency with design efficiency at operating conditions.
- d) Assessment the impact of individual equipment/machinery performance's variation on overall plant efficiency with special attention to steam leakage, condensate recovery, combustion control, insulation system, back pressure of turbine etc.
- e) Analysis the present energy monitoring system, metering system and energy reporting system.
- f) Analysis the heat rate and include the financially attractive and technically viable heat rate improvement mechanisms under present condition.
- g) Identify Energy and cost saving measures/opportunities in the power plants and its impacts on GHG emission through internal and external benchmarking for energy performance potential, basis for monitoring and target setting exercises, setting of benchmarking parameters.
- h) Provides an overview of typical energy audit costs in different power plant.
- i) Demonstrate cost effectiveness of implementing the efficiency enhancement techniques to be proposed by the consultant – whether the increase in efficiency resulting from the proposed techniques will ensure positive return from the investment.
- j) Prepare necessary action to improve upon method of reporting data, energy management system and improving energy efficiency.
- k) Identification of specific barriers for improving energy efficiency of power plants.
- l) Detailed infrastructure inspection and site survey of the power plants.
- m) Drawing of performance profile of each unit including operating parameters, such as effective output capability, power plant availability, plant factor, heat rate and efficiency of each unit.
- n) Preparation of unit / plant wise BOQ for equipment/spares parts requirement (separation of quick consumption and slow consumption) to achieve the expected performance improvement.
- o) Preparation and submission of Energy Audit Report for each of the power plants.
- p) Prepare guideline, checklist for audit area, template/format for different types of power plants so that auditing activities may be replicated in other power plants.

- q) Analysis the potentiality of industrial (Composite Textile Mill with washing plant, Steel Mill, Fertilizer industry & Pharmaceutical industry) cogeneration, including use of waste heat and its size and type.
- r) Cost-benefit analysis of industrial cogeneration.
- s) Potential role of cogeneration in the future power and heat supply system.
- t) Long-term role of cogeneration in the overall system.

5. Detailed Outputs of the assignment (and applicable quality standards, where applicable)

5.1 Team Composition and Qualification Requirements for the Key Experts (and Any Other Requirements that Will Be Used for Evaluating the Key Experts under Data Sheet 21.1 of the ITC)

Consulting services are solicited from consulting firms having experienced in carrying out studies for energy auditing and efficiency improvement for Power Plants along with assessment of cogeneration potential in the Industrial Sector. Consulting firms should have experience to perform consultancy services, experience of similar assignments, experience in similar conditions, firm's capability and availability of appropriate skills among key staffs, availability of resources, relevant transactional experience. The proposer is expected to engage the following categories of key experts for the Project and CVs shall be submitted accordingly:

- **Team Leader (Position-1, International, 6 person months):** The Team Leader must have a Masters/Bachelor's degree in Electrical/Mechanical Engineering or any relevant engineering subject. The expert must have a minimum of 15 years of experience in the field of Power Generation. S/he must have knowledge of best practice in the electricity utility industry including energy auditing, electricity investment planning, costing of operations, O&M, design, execution & monitoring of power plants. Working experience in energy efficiency of Power Plant would be an additional qualification. Certified Energy Auditor will be given preference.
- **Energy Auditing Specialist (Position-1, International, 4 person months):** The energy auditing specialist should have a degree in engineering or a related area, and at least 15 years of relevant working experience including in power system operations, efficiency auditing and energy management. Prior experience in conducting energy audits at power plants and conducting training on power plant energy auditing would be a distinct advantage. Certified Energy Auditor will be given preference.
- **Energy Auditing Specialist (Position-1, National, 6 person months):** The energy auditing specialist should have a degree in engineering or a related area, and at least 12 years of relevant working experience including in power system operations, energy enhancement, auditing and energy management. Prior experience in conducting energy audits at power plants and conducting training on power plant energy auditing would be a distinct advantage. Certified Energy Auditor will be given preference.
- **Power System Specialist (Position-1, National, 6 person months):** The Specialist must have a Bachelor's degree in Electrical Engineering. The expert must have a minimum of 12 years of experience in the field of Power Generation. S/he must have knowledge of best practice in plant design, O&M, execution & monitoring of power plants. Experience as Head of Power Plant would be an additional qualification.

- **Cogeneration Analysts (Position-1, International, 4 person months):** The Specialist must have a Masters/Bachelor's degree in any Engineering or any relevant subject with minimum of 10 years of experience in related fields. S/he must have knowledge of best practice in Cogeneration in power/industrial Sector.
- **Financial Analysts (Position-1, National, 2 person months):** The analyst must have a Masters in Finance/Economics/ Business Administration/ Chartered Accountant or any relevant subject with a minimum of 10 years of experience in financial/economic analysis. He/She must have the experience of working with power sector for at least 5 years.

5.2 Reporting Requirements and Time Schedule for Deliverables

- Inception Report within 1(one) month after signing of the contract
- Interim Report within 3 (Three) months after signing of the contract.
- Draft Final Report within 5 (Five) months after signing of the contract with the energy auditing, result analysis of efficiency improvement technics for power plants and potentiality assessment of cogeneration. Draft Final Report will have separate energy auditing report on 8 (eight) power plants;
- Hold Stakeholders Consultation Workshop on Draft Final Report after 15 days of submission of Draft Final Report ;
- Finalization of Final Report within 6 (Six) months after signing of the contract.

10(Ten) copies of each report has to be submitted along with a soft copy;

Person to receive the Report: Project Director, BPSDCB Project, Power Division

The consulting firm will report to Project Director, BPSDCB Project, Power Division for billing and contract management. For work execution purposes, the consulting firm will work with BEREC, SREDA, Power Cell, BPDB, BREB, PGCB and other concerned utilities.

5.3 Relevant background information or materials for the assignment: *Not applicable*

5.4 Indication is downstream work is potentially considered: No downstream work is expected at the end of the feasibility study.

5.5 Training and capacity building requirement:

Manpower training: Arrangement for a Tanning program of approximately 15 personnel to enrich experience of project personnel and officials of Power Division and Power Cell. Tanning program will be designated in consultation with client.

5.6 Equipment procurement: —*Not applicable*

6. Client's Input and Counterpart Personnel

(a) Services, facilities and property to be made available to the Consultant by the Client:

Facilitation and Reporting

Consultant will work in close association with BPSDCB Project Office, BEREC, SREDA, Power Cell, BPDB, BREB, PGCB and other relevant utilities. A coordination mechanism will be set

up to review progress, provide guidance and advice. The designated personnel of the entities will interact with the Consultants and provide data, arrange discussions and assistance as required. The Consultant will work under the guidance of Project Director, BPSDCB Project.

Logistics Support

BPSDCB Project Office will provide meeting room and logistic support for the communication with executing agencies when necessary. Office accommodation, site visits, secretarial service will have to be arranged by the consulting firm at their own costs.

(b) Professional and support counterpart personnel will be assigned by Project Director, BPSDCB Project to the Consultant's team

(c) Selection of sites and concerned Utility: The concerned official under whose guidance the study will be carried out will be mentioned when RFP will be issued.

7. Client will provide the following inputs, project data and reports to facilitate preparation of the Proposals:

The consultant will have to collect relevant project data and reports from the relevant departments as required to successfully completing the study.