

**TOR for Engineering Consulting Services for Indo-German Trigen Project  
for performance monitoring at  
Jai Prakash Narayan Apex Trauma Center (JPNATC, AIIMS)**

## **1. Background**

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is supporting Bureau of Energy Efficiency (BEE), Ministry of Power (MoP) under the Indo-German Energy Programme (IGEN) in the implementation of the energy conservation measures and demo projects as per the identified and prioritized action plan. Energy consumption for cooling is growing rapidly in India for air conditioning in buildings and industries with increasing GDP. GIZ in cooperation with the BEE, started a new project to promote energy efficient cooling technology based on Combined Cooling, Heat and Power (CCHP or Trigenation, i.e. the simultaneous generation of electricity and utilization of the waste heat for heating and cooling purposes) in India. The objective of the TRIGEN Project is to increase the use of Trigenation-based energy efficient cooling technologies, which helps to reduce greenhouse gas emissions. This shall be achieved by replacing existing air conditioners with more efficient ones and by incorporating Trigenation technology in new air conditioners and building planning.

The TRIGEN Project includes:

- Set-up of a demonstration project in a public building
- Identification of potential sites for replication
- Information dissemination and promotion activities
- Development of a concept to improve the legal and economic framework for Trigenation

The pilot plant is now commissioned and needs to be monitored for its performance remotely. To arrange for the remote monitoring hardware and software are required through a monitoring system. This monitoring system need to be put in place both at JPNATC and BEE (MoP) office at Sewa Bhawan or as required. A complete monitoring system including software and hardware with integration with the existing system is required to monitor the real time performance and operation of the Trigen plant.

## **2. Objective**

To setup a Performance Monitoring System inclusive of hardware and software which ensures that the demo project become a successful show case.

## **3. Methodology**

The entity/company must take care of complete monitoring system including hardware and required software. The invited offer must contain the following sections:

1. Software - design of the system
  - a. Scada/Modbus/Labview or other
  - b. Defining graphics
  - c. Input/output (linking of the equipments and with the existing AC system)
  - d. Trends, graphs, recording of data, etc.
  - e. Redundancy requirement
2. Hardware

- a. Data acquisition system
  - b. Required meters (flow meters, cables, computers, sensors, etc.)
  - c. Interface requirement (engineering, sub-system, etc.)
  - d. Communication system and protocol
3. Methodology and reports at monthly interval
  - a. Real time/online on website/GPRS
  - b. Periodic logging for a year
4. Case study at the completion of one year of monitoring
  - a. Energy savings
  - b. Service quality improvement
  - c. GHG savings
  - d. Development of building energy performance indices (BEPs)
    - i. Trigenation (Gas engine, VAM, Chillers, etc.)
    - ii. Cooling water system
  - e. Other project specific parameters

### 3. Scope of work (Software/Hardware/Sensors)

1. Developing a software to measure and record the performance of the system that includes software, different parameters like temperatures, pressure, flow rate, power, voltage, current
2. The software will be helpful in monitoring the parameters and plant remote control facility is not necessarily required
3. Supply of data logging modules with operating software
4. Scanning time must be specified and can be varied according to requirement
5. Supply of interfacing hardware (with software if required) with the existing system with the monitoring system
6. Setting up of sensors and measuring devices, etc. with the software
7. The software must be able to show real time data and plots/graphs on webpage [www.trigenindia.com](http://www.trigenindia.com)
8. Software must be able to log data (for at least one year) and plot graphs for different parameters like total energy saved, energy consumption, running hours, electricity produced, air conditioning from Trigen plant, operation hours, GHG/CO<sub>2</sub> saving, etc.
9. The collected data must be stored locally in hard disks and provision to download remotely
10. Comparison with the baseline for the present system and operation at JPNATC
11. Maintenance of the monitoring system (hardware and software) for one year
12. Setting up a remote/online monitoring at IGEN/BEE office
13. Training on how to use the software and hardware for monitoring purpose
14. Supply of required sensors/measuring devices according to the annexure
15. The system must be provided with a power back of at least 30 minutes and needs to be integrated with both main supply and emergency power
16. Foundation for sensors, hardware, cable trays, data-loggers, computers, etc. and all other civil work necessary for setting up the monitoring system must be include in the offer
17. Installation of complete monitoring system that consist of software and hardware must be done by the company

### 3. Deliverables

- a. Individual item wise quote
- b. Monitoring system with software and required hardware
- c. Installation of the monitoring system
- d. Installation of sensors/measuring devices to collect relevant data
- e. Training on the monitoring system and back-end support for any difficulty in operating the software and system for one year