

PART 2 – SCOPE OF WORKS

1. Detailed Scope of Works

6.1 Programme background and conditions of work

In order to support the implementation of energy efficiency interventions in South Africa, the Swiss Agency for Development and Cooperation (SDC) has formulated a support programme called 'Energy Efficient Building Programme 2010 – 2015'. The programme is committed to supporting South Africa to contribute to the reduction of carbon dioxide emissions through energy efficiency interventions at policy, monitoring, research, training and implementation level.

The Department of Energy (DoE) developed the National Energy Efficiency Strategy in 2005 setting sectoral targets for the next 10 years. The national strategy for energy efficiency was revised in 2008 and updated targets were agreed to be achieved by 2015. Another review is underway at present. The targets make allowance for forecasted growth, and are defined as percentage reduction in the predicted end-usage of electricity by 2015. The overall target is defined as reduction of the national energy demand by 12% in 2015, which corresponds with the end of the current strategy's programme period. The overall target is divided into sub-targets for each sector.

The DoE, SDC, German Agency for Technical Cooperation (GIZ), the Danish government, South African Local Government Association (SALGA), and Department of Public Works (DPW) are all stakeholders. The strategy being adopted is to install three-phase meters to the main incoming electrical supply of agreed upon DPW buildings within 6 months. Each of the buildings in which a meter is installed will also be subjected to a walk through audit. 240 buildings are initially targeted with a view to increasing the scope up to 1,000 buildings. The estimated timeframe for the project is 6 months and could begin immediately, subject to following proper procurement procedures.

6.2 OBJECTIVE OF THE PROJECT

The overall objective of the proposed project is to meet, and monitor progress against the national target for energy efficiency in the public sector through the implementation of energy savings interventions and the establishment of a comprehensive monitoring system.

6.3 Specific Objective of the Consultancy

To obtain data relating to consumption patterns in public buildings, and to identify potential energy savings interventions within those buildings. Walk through energy audits will be undertaken and/or smart meters installed in up to 1,000 buildings, beginning with a sample of 240 buildings (the number of sample buildings to be audited is subject to the discretion of the DoE). This will form part of the existing Energy Efficiency Monitoring and Implementation Project (EEMIP) funded by the Swiss Agency for Development and Cooperation (SDC). The data will also be used for Energy Performance Certification (EPC) in public sector buildings.

6.4 Scope of Work

6.4.1 Installation of tele- or smart energy meters

- Provision and installation of one or several tele- or smart energy meters that allow reading of energy consumption from one central point outside the measured building.

The meters shall comply with the following basic requirements:

The system needs to measure, uninterrupted, various inputs on a high /low current (I), Voltage (V) and demand Kilo Volt-Ampere (KVA) of buildings and report data back to a central database (Server). There shall be a web based HMI that is easy to use and already established where such sites are being monitored.

1. Communications

- 1.1 Local: IEC 62056-21
- 1.2 Remote: Optional RS232
- 1.3 Fast data collection using Data Stream Mode, and 90 days data in 30 seconds

2 System Connections/ Logging Hardware

- 2.1 3 Element meters: 3 phase 4 wire

3 Security

- 3.1 The meter has many security features. The meter stores all registration and configuration data to non-volatile memory card installed inside

4 TECHNICAL DATA

4.1 Features

- 4.1.1 Accuracy: kWh Class 1 or Class 2 and kVarh Class 2 or Class 3
- 4.1.2 Modular design to allow future upgrades
- 4.1.3 Comprehensive tariff structure, Instrumentation
- 4.1.4 Large digit (9.8mm) display, IEC 62056-21 communications port
- 4.1.5 Internal clock with battery back-up and 15 year product life
- 4.1.6 Extensive security data, double insulated and polycarbonate case
- 4.1.7 Compact design

4.2 Options

- 4.2.1 kWh export, kVAh (Kilo-Volt-Amp-hours) and kVA
- 4.2.2 Current Transformer (CT) or direct connected, serial communications and load profiling
- 4.2.3 Can be read without power by using replaceable battery

5 USER INTERFACE & DATABASE

- 5.1.1 Software capabilities must include the following specifications namely:
- 5.1.2 Software shall be username and password driven
- 5.1.3 Software shall be easy to use and shall display summarised customised data on first
- 5.1.4 Must be able to capture all details of the buildings that the unit is installed including
 - 5.1.4.1 Region
 - 5.1.4.2 Municipal Area
 - 5.1.4.3 Address
 - 5.1.4.4 GPS coordinates
- 5.1.5 GPS coordinates must be able to be referenced to another site i.e. another weather station's data
- 5.1.6 All data shall be able to be extracted in CSV format in all of the following intervals for any selectable date and time.
 - 30 Min
 - 60 Min
 - Day
 - Month
- 5.1.7 Different methodologies shall be able to be used for different sites and any amount of customised calculations shall be allowed.
- 5.1.8 An infinite number of charts shall be allowed and shall be user defined.
- 5.1.9 Charts shall show values and must be able to be zoomed in, to see information clearly and more precisely

5.2 Database

- 5.2.1 Data must be written to a central database (SQL server or equivalent) in a secure environment.
- 5.2.2 Data must be backed up at regular intervals and redundancy measures shall be in place.

In addition to the supply and installation of the above meters, the contractor will be responsible for:

- Collection of historic data (annual consumption for the last three years) and establishment of an energy consumption baseline. Historic data can be obtained directly from the utility provided the meter number is taken.
- Communication and approval (if needed) with ESKOM or relevant utility if meters are installed parallel to existing ones.

It is acceptable if ESKOM or the local utility provides some or all meters as long as access by DoE to the data produced can be provided for.

6.4.2 Smart Meter Data Storage & Reporting

Storage

- Data on smart meters must be readable remotely – half hourly data must be transmitted using GSM/ GPS to the database that will be hosted by SANEDI.

NB: The contractor is responsible for ensuring that all meters are correctly installed, including relevant software for data transmission, and that data is being transmitted without error to the SANEDI database*.

The data is the property of the Department of Energy and the database shall therefore be handed over in its totality on completion of contract. If the Department requests a copy of the data during the contract implementation, this shall also be provided.

* Service Providers shall be informed if the database server is located elsewhere.

6.4.4 Walk-through Energy Audits

The walk through audit will include following steps:

- Interview with the management
- Collect data related to nature of the building, activity undertaken within the building and building floor space.
- Obtain historic data on annual energy consumption, both from electricity and other sources
- Overview of the building with regards to any energy production units, processes and energy consuming equipment
- Do a walk-through of the whole building, collect data and take pictures.
- Identify the energy production equipment and major consuming equipment. Check and record key data from marking plates.
- Pay attention to areas and equipment with high energy consumption.
- Look at habits and procedures that could be changed to improve energy efficiency.
- Identify of potential energy saving measures, both related to electrical installations and machinery and other measures (such as insulation, natural lighting, etc).

The aim of the Walk Through Audit is to list all potential energy saving measures found. The Walk-Through Audit usually takes up to 1-2 days, depending on the size and complexity of the building. The purpose is to meet the management and staff, and get a general impression of the state of housekeeping, maintenance, and the support from the staff for the further Auditing work.

Reporting

Reports shall be made for each simple Walk Through Audit. Examples of the content of the Audit reports are presented in Appendix one. The content of the Audit report will be described during the project inception. Besides general recommendations for potential pilot projects in the report, its main purpose is to prepare for identification of specific energy efficiency interventions, more detailed analysis where necessary, and eventual introduction of the Energy Performance Certificate programme.

Content	Explanation	Key data to be included
1. Executive summary		
2. Introduction 2.1 Background and Objective 2.2 Short presentation of the building 2.3 Scope of works, description of the Audit methodology and output. 2.4 Involved persons in the Audit and amount of input 2.5 Overall list of used Audit equipment and software	In this section a short description is made about: <ul style="list-style-type: none"> • The project purpose • The premises where the Audit is performed • The Audit work including presentation of the • Auditors and involved staff from the company • Audit measuring equipment • Report output 	<ul style="list-style-type: none"> • Production and address of industry. • Name of responsible persons (owners, operation and maintenance staff) • Name and information of contact person at the building during the Audit. • Persons from the building, who have assisted with the Audit. • Names, positions and contact information of the involved Auditors • List of used Audit equipment and software
3. Assumptions 3.1 Electricity price 3.2 Fuel price 3.3 Water and wastewater prices 3.4 Other assumptions	In this section all the important assumptions are presented including payment, price and tariff for electricity and fuel. These are the basis for the calculations of costs. Description of origin of data used for determining energy consumption (bills, metering, etc.)	<ul style="list-style-type: none"> • Unit prices of the used energy • Subscription rate/load fee (fixed part)
4. Production 4.1 Building description	In this section the building is described and should include but not limited to the following: <ul style="list-style-type: none"> - A plan on the site of the property in m²; - Building information with plans on elevations, sections and all floors; - Nett floor area (excluding garages and storages as defined by SANS 204 & 10400XA) of every single 	

	<p>building, clearly separating nett floor area from outside area, storages and garages;</p> <ul style="list-style-type: none"> - Vacant floor areas differentiated in A=30% vacant per year, B=60% vacant per year and C=0% vacancies/always occupied; - Classification of each single building according to the National Building Regulation (office block=G1...etc.); - Occupancy: If more than 10% of the building is occupied by a different classified building (e.g. shops on ground floor), then the occupancy rate of every classification has to be specified; and - All energy using devices and types (that run on gas, electricity or renewable) so that energy consumption data can be displayed for <ul style="list-style-type: none"> o each single building (excl. garages and storage), o building parts that are not included in the nett floor area: balconies, terraces, garages, storages etc, and o the surrounding property (garages, garden 	
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	illumination pools, etc.)	
<p>5. Energy overall</p> <p>5.1 Energy sources, Fuel and Electricity supply and distribution</p> <p>5.2 Overall consumption & costs</p> <p>5.3 Intensity of Energy</p> <p>5.4 Energy Utilisation per process</p> <p>5.5 Energy Management System</p>	<ul style="list-style-type: none"> • Energy sources/supply • Presentation of the overall annual data for energy usage for at least the last 3 years. Provision of consumption data for the nett floor area of every single building, i.e. energy consumption in garages, storages, pools etc have to be deducted if there is only one meter for the entire property available! If energy outside of the building cannot be measured individually, its consumption has to be estimated based on actual load, estimated running times etc. • Energy pattern and profile • Presentation of the intensity of energy consumption per square meter • Description of the electrical system • Description of the implemented energy management system (if any), including metering procedure. 	<ul style="list-style-type: none"> • Energy sources • Overall annual energy consumption for the last 3 years • The intensity of energy consumption • Installed main meters and sub meters
<p>6. Steam and heat production</p> <p>6.1 Description of boilers, kilns, oven, etc.</p> <p>6.2 Flow charts</p> <p>6.3 Fuel system</p> <p>6.4 Efficiency of boilers, kilns, oven</p> <p>6.5 Steam, Water and Condensate system</p> <p>6.6 Pipe installation</p>	<p>Based on the questionnaire and information collected of the individual heat production systems are described:</p> <ul style="list-style-type: none"> • Description of each boiler, kiln, oven, etc. • Efficiency measurements 	Used Audit equipment

<p>6.7 Operation and maintenance 6.8 Proposal for improvements and problems experienced</p>	<ul style="list-style-type: none"> • Operation and maintenance details • Operation hours and use • Fuel source and consumption • Efficiency and heat losses 	
<p>7. Cooling system 7.1 Description of system 7.2 Flow chart 7.3 Equipment operation and maintenance 7.4 Efficient use of refrigeration 7.5 Pipe installation 7.6 Proposal for improvements and problems experienced</p>	<p>Based on the questionnaire and information collected of the cooling/chiller system is described:</p> <ul style="list-style-type: none"> • Cooling system including a flow chart • Electrical consumption and system performance • Condition of the cooling 	Used Audit equipment
<p>8. Compressed air system 8.1 Description of system 8.2 Flow chart 8.3 Equipment maintenance 8.4 Efficient use of compressed air 8.5 Proposal for improvements and problems experienced</p>	<p>Based on the questionnaire and information collected the compressed air system is described including:</p> <ul style="list-style-type: none"> • Use of compressed air including flow chart • Operation and maintenance details; operation hours and use 	Used Audit equipment
<p>9. Pumps and motors 9.1 Description of pumps and motors 9.2 Equipment operation and maintenance 9.3 Proposal for improvements and problems experienced</p>	<p>Based on the questionnaire and information collected pumps and motors are described including:</p> <ul style="list-style-type: none"> • Use of pumps and motors • Effect factor of pumps and motors • Operation and maintenance details; operation hours 	Used Audit equipment
<p>10. Electricity utilization 10.1 Describe the distribution and consumption 10.2 Electricity measurements, equipment and method 10.3 Measurement results and analysis 10.4 Proposal for improvements and problems</p>	<p>Based on the questionnaire and information collected the utilization of electricity is described including:</p> <ul style="list-style-type: none"> • Operation and maintenance details; operation 	Used Audit equipment

experienced	hours and use	
11. Other equipment using energy (e.g. industrial cookers) 11.1 Description of equipment and energy consumption 11.2 Collected data and analysis 11.3 Proposal for improvements and problems experienced	The types of other equipment are described: <ul style="list-style-type: none"> • Type, size and capacity compressed air including flow chart • Operation and maintenance details; operation hours and use 	Used Audit equipment
12. Energy saving measures 12.1 Overview and Conclusion 12.2 Recommendation for energy savings 12.3 Savings, Investment and Payback period	The conclusion of the Audit with proposals for energy saving measures. The energy savings are calculated, investment estimated and simple payback periods are presented.	<ul style="list-style-type: none"> • Savings in energy units • Potential savings in cost • Estimated investment cost (low, medium and high cost)

Output

The contractor shall submit a Walk Through Energy Audit Report for each building.

6.4.5 Energy Audits Questionnaire

An energy audit questionnaire must be provided as part of the methodology for carrying out the energy audits.

6.4.7 Skill Transfer, Training and Jobs

- During the implementation of the project there will be identification of relevant personnel in the organization occupying the building to ensure sustainability of the use of the meters.
- As part of the completion report the number of jobs created during the pilot will be indicated.

6.4.8 Work Plans

The duration of the project should not run beyond 6 months after commencement date. A time-schedule showing all scheduled project milestones and shall be based on the list of 240 priority buildings. See Annexure 2 and Pricing Schedule.

6.4.9 Project Areas

All the priority sites for project building areas are listed according to categories in Annexure 2.

6.5 EXPECTED OUTPUTS

The progress and success of the program will be measured by the quantity and quality of the data gathered by means of completed questionnaires, the data retrieved from the smart metering server, and the energy audit reports. It should be noted that the quality of data is crucial as the Department of Energy and SANEDI will use this data and information as part of the development of Energy Efficiency Target Monitoring System, and the development of Energy Performance Certificates for buildings. The energy consumption data collected through the smart meters shall be analysed, and a report with clear energy saving potentials and implementation recommendations will be drawn up for each building.

The evaluation of the project will be done according to the following work stream descriptions:

- Data collection, capturing and analysis, including the energy audits questionnaires completed per building and installation of smart meters;

6.5.1 *Data analysis;*

- Identification of energy savings potential; and
- The output will be in the form of a final report for each building. The final reports and all raw data will be made available to the Department of Energy and Department of Public Works in order for it to be utilised for the purposes of the initiatives mentioned above.

Completion Report

- The completion report will be provided per building in line with the guidelines provided in Annexure 1
- For every building\facility data will be completed for the questionnaire provided.

6.5.3 *TIMEFRAME*

The duration of the project should not run beyond 6 months after commencement date. A time-schedule showing all scheduled project milestones must be included in the proposal.