Certificate of Compliance

ENERGY AUDIT REPORT

of

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH,

Post Box No 62, Tamaka, Kolar- 563103.

This is to certify that an Energy Audit of SDUAHER campus has been conducted by Dr. Vanishri Arunachalam and Mr. C. Madhan Mohan of M/s Tulasi EOHS Consultancy Services on 29th June 2020.

The Audit Report has been found to be satisfactory.

Mr. Anil Patil Kulkarni
Managing Director

REGISTRAR
Registrar
Sri Devaraj Urs Academy of Higher Education and Research
Tamaka, Kolar - 563103.

Gayathri
IQAC ARAR-6

Sri Devaraj Urs Academy of Higher Education and Research
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"Solutioning" in the Consultation/Training/Auditing

ENERGY AUDIT REPORT

SDUAHER

Submitted by

TULASI EOHS CONSULTANCY SERVICES

Gayathri
IQAC AQAR-II
Sri Devaraj Urs College of Nursing
Tamaka, Kolar-563101.

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This is to certify that the following utilities were carried out Energy audit in the month of June'2020.

Details of Facilities Audited Main building of Academy / Institution which includes Laboratories, Libraries, Hospitals, All departments and Hostel and Academy / Institution Canteen.

Dr. Vanisri Arunachalam

Er. C. Madhan Mohan

Authorized Signatory

For TULASI EOHS CONSULTANCY SERVICES

Date: 29-06-2020

Place: Chennai

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ENERGY AUDIT REPORT

2019-2020

Done by

Dr. A. Vanisri

Er. C. Madhan Mohan

TABLE OF CONTENTS

Separately Enclosed- CD with soft copies of

1. **Data recorded during specific load combinations**

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2. INTRODUCTION

An energy audit is an inspection, survey and analysis of energy flows, for energy conservation in a building, process or system to reduce the amount of energy input into the system without negatively affecting the output(s). In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprints.

The scope of an energy audit can comprise a detailed review of the energy performance of an organization, Significant Energy User(s), systems, energy-using processes and/or equipment. It is typically based on appropriate measurement and observation of actual energy performance for the defined energy audit scope.

Energy audit outputs typically include the information on current energy consumption and energy performance, and they can be accompanied by a series of specific recommendations ranked by energy performance improvement or financial return on investment, based on analysis of specific site data and operating conditions.

In the present study, the academy comprising of a medical college and a tertiary care hospital, an electricity audit has been done. In this study Admin buildings, Specialty services ,Operation theaters , Diagnostic service department, Clinical laboratories and the Service areas viz. Laundry, Kitchen, CSSD, Backup power supply, AC plant, Manifold Rooms, Pharmacy service instrument, Fans, Air conditioners, Computers facilities , IT infrastructures, Digital Libraries, Hostel facilities etc., were considered. We have studied total budget of the academy, total economic investment of academy on the electricity and total electricity generated from the solar electricity generation unit. Also, we have studied total saving of "electricity" and the exact contribution of bulb, fans, computer, instruments etc., in the total requirement of electricity. "We have the studied all the above said parts of energy audit by collecting the exact details of the inputs through a survey".

3. SUMMARY STATEMENT

The IQAC Director, SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION & RESEARCH, located at Karnataka requested to carry out Energy Audit at their campus. Energy and Power Quality Audit team had undertaken harmonic and other electrical parameter measurements on 30th April 2020 at their institute of **2420 kVA capacity**.

The summary of the information are as follows:

The measurements were undertaken using Fluke Model: series 435 -II Power Quality Analyzer and Make Elmeasure Model LG +5310. The following parameters were recorded by the above instrument with 15 **minutes recording sample time over the 8 hours,**

(i) The following parameters were recorded

(a) 3 Phase voltage
(b) 3 Phase current
(c) Frequency
(d) % Voltage Unbalance
(e) % Current Unbalance
(f) Active Power in kW and reactive power in kVAR
(g) Power Factor
(h) % Voltage THD
(i) % Current THD

The parameters (a) to (i) were recorded for every 15 minutes period by the meter and they are averaged over 15 minutes (for convenience of handling)

*The definition of THD are provided at the end of this section

(ii) The trend recordings for various parameters (voltages, currents, powers and power factors) are also taken for the different periods of recording times.

(iii) This is followed by the report of the recordings for the various combinations of equipment in operation to cover possible operational modes with the time stamp. For these periods, the recorded parameters were provided **without averaging but as the raw data** at 10 sec sample time records. The corresponding THD figures and the calculated TDD values with 4500 kVA as the base are also provided.

(iv) The scrutiny of the data presented for the THD. The voltage THD figures are also well within the stipulated 3.5% whereas the current THD is in the range between 4.04 % to 16.03% which is high as per the CEA.

(v) These values are not well within the IEEE 519-1992 stipulations which are internationally accepted values.

(vi) The extracts from IEEE regulations and CEA regulations are provided as annexure to this report.

(vii) **Definitions of THD and TDD:**

THD = Total Harmonic Distortion

The ratio of the root-mean-square of the harmonic **(voltage or current)** content to the root-mean-square of the fundamental quantity, expressed as a percent of fundamental. THD typically refers to instantaneous measurement of harmonic distortion at an individual piece of equipment or group of loads, based on the actual fundamental current that is flowing during the measurement. THD is the typical measurement made with a harmonic analyzing equipment which takes in 3 phase voltages and currents from which the same is extracted as per the following ratio.

$$THD = \sqrt{\frac{Sum\ of\ Squares\ of\ amplitudes\ of\ all\ harmonics}{Square\ of\ amplitude\ of\ fundamental}}\ 100\%$$

TDD = Total Demand Distortion

The total root-sum-square harmonic current distortion, in percent of the maximum demand load current (15 or 30 minute demand).

$$TDD = \sqrt{\frac{Sum\ of\ squares\ of\ amplitudes\ of\ all\ harmonics}{Square\ of\ maximum\ demand\ on\ load\ current}}\ 100\%$$

When the point of common coupling (PCC) is considered at the service entrance or utility metering point, IEEE-519 recommends that the maximum demand load current (IL) be calculated as the average current of the maximum demand for the preceding 12 months. To calculate TDD for new construction, prior to installation of equipment, one may use good engineering judgments to estimate the expected maximum demand load current. A conservative approach is to use the summation of the FLA ratings of all motors.

4. MEASURING EQUIPMENT SPECIFICATION

Features of Power Quality Analyzer Fluke 434 Series II

- Current measurement is 6000A.
- Power measurement is 6000W.
- Voltage measurement is 1000V.
- Energy loss calculator: Classic active and reactive power measurements, unbalance and harmonic power, are quantified to pinpoint the fiscal costs of energy losses.
- Troubleshoot real-time: Analyze the trends using the cursors and zoom tools.
- Measure all three phases and neutral: With included four flexible current probes with enhanced thin flex design to fit into the tightest places.
- Automatic trending: Every measurement is always automatically recorded, without any set-up.
- System-monitor: Ten power quality parameters on one screen.

• Logger function: Configure for any test condition with memory for up to 600 parameters at user-defined intervals.

• View graphs and generate reports: With included analysis software.

• Energy monetization – calculate the fiscal cost of energy waste due to poor power quality.

• Energy assessment – quantify the before and after installation improvements in energy consumption to justify energy saving devices.

• Frontline troubleshooting – quickly diagnose problems on-screen to get your operation back online.

• Predictive maintenance – detect and prevent power quality issues before they cause downtime.

• Long-term analysis – uncover hard-to-find or intermittent issues.

• Load studies – verify electrical system capacity before adding loads.

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