Elion Technologies & Consulting Pvt Ltd

Certificate

This is to certify that Green Audit at **PTVA's Institute of Management, Chitrakar Ketkar Marg, Behind M.L. Dahanukar College of Commerce, Vile Parle (E), Mumbai, Maharashtra, 400057** was carried out for the year **2022 - 23.**

The college has provided the requisite data and credentials for examination. The activities and steps undertaken by the college have been validated. The college's endeavors in the realm of environmental preservation and sustainability are recognized and lauded.

Director
PTVA's Institute of Management
Chitrakar Ketkar Marg,
Behind M. L. Dahanukar College,
Vile Parle (E), Mumbai-400 057.

Audit Date – 15/12/2023
Valid Up to – 14/12/2024

Audit Officer

Certificate Number
GA/2023/PTVAIM

Elion Technologies & Consulting Pvt Ltd

Certificate

This is to certify that Environment Audit at **PTVA's Institute of Management, Chitrakar Ketkar Marg, Behind M.L. Dahanukar College of Commerce, Vile Parle (E), Mumbai, Maharashtra, 400057** was carried out for the year **2022 - 23.**

The campus has provided necessary data and credentials for assessment. It harnesses solar energy as a renewable power source and has established a rainwater harvesting system for storing water in an underground tank.

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Audit Officer

Certificate Number
ENV/2023/PTVAIM

7.1.6.

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Certificate

This is to certify that Energy Audit at **PTVA's Institute of Management, Chitrakar Ketkar Marg, Behind M.L. Dahanukar College of Commerce, Vile Parle (E), Mumbai, Maharashtra, 400057** was carried out for the year **2022 - 23.**

The college administration has taken steps to implement sustainable practices targeting decreased energy consumption. Among these initiatives are the installation of a solar power plant and the adoption of LED lights, all geared towards promoting energy efficiency on campus.

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Audit Date – 15/12/2023
Valid Up to – 14/12/2024

Audit Officer

Certificate Number
EA/2023/PTVAIM

PSI ENERGY INFRA

REPORT OF ENERGY AUDIT

CONDUCTED AT

PARLE TILAK VIDYALAYA ASSOCIATION'S INSTUTUTE OF MANAGEMENT

VILE PARLE EAST, MUMBAI

JAN 2023

Director
PTVA's Institute of Management
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Mumbai
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PSI ENERGY INFRA

PSI ENERGY INFRA CONSULTING (OPC) PVT LTD
Office no. 3, ground floor, Eishita, Shiv Vallabh cross road, Ashokvan, Dahisar east, Mumbai 400068
Deskphone : +91-22-49767603, www.psienergyinfra.com

Date : 27-jan-2023

Kind Attn : Dr. Tejashree Deshmukh, Dean Academics & Professor

PTVA's Institute of Management
Chitrakar Ketkar Marg. Behind M.L. Dahanukar College,
Vile Parle (East), Mumbai-400057

Sub : Submission of Report of Energy Audit

Dear Dr Deshmukh

We thank you for the opportunity to carry out an energy audit at the PTVA- Institute of Management facility and are pleased to submit report of findings and recommendations.

The report comprises of three sections

Section-1 : Introduction to energy audit

Section-2 : Description of energy processes

Section-3 : Energy performance and energy saving opportunities

We would like to thank Mr Abhishek, Mr Kumavat and the Ops team for the assistance during the audit

Thanking you

Yours truly

For PSI ENERGY INFRA CONSULTING (OPC) PVT LTD

Aniruddha Deshpande, director
9819156654

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1,1 Introduction to Energy Audit

Energy audit is the study of quantification of energy consumption of a facility, comparison of energy consumption against productivity, identifying wastage and formulation of energy saving opportunities.

An energy audit is the first step towards reducing energy, and as a result, environmental footprint, of every residential, commercial, educational or industrial facility.

1,2 Energy conservation act, 2001

MINISTRY OF LAW, JUSTICE AND COMPANY AFFAIRS (Legislative Department) New Delhi, the 1st October, 2001/ Asvina 9, 1923 (Saka) The following Act of Parliament received the assent of the President on the 29th September, 2001, and is hereby published for general information:--

Energy Conservation Act accommodates productive utilization of energy and its preservation for matters associated therewith or incidental thereto. It was instituted by the Parliament in the Fifty-second Year of the Republic of India, was enacted on 29th September 2001 and came into practice from 1st march, 2002. This act resulted in the formation of the Bureau of energy efficiency which came into effect from 2002.

1,3 Bureau of Energy Efficiency, Government of India

The Government of India set up Bureau of Energy Efficiency (BEE). on 1st March 2002 under the provisions of the Energy Conservation Act, 2001. The mission of the Bureau of Energy Efficiency is to assist in developing policies and strategies with a thrust on self-regulation and market principles, within the overall framework of the Energy Conservation Act, 2001 with the primary objective of reducing energy intensity of the Indian economy.

1,4 Objectives of the Act

1. To serve the efficient and effective use of energy and its conservation.
2. Give an approach system and direction to national energy conservation activities.
3. Organize policies and programmes on the effective utilization of energy with shareholders.
4. Build up framework and strategies to verify measures and monitor energy efficiency improvements in the private and public sector at an individual and national level.
5. Leverage the support of multilateral, bilateral and private sectors to make into effect the Energy Conservation Act.
6. Show Energy efficiency delivery system through a public-private partnership.
7. Advance energy efficiency in the nation.

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8. To plan, manage and actualize energy conservation programs as visualized in the Energy Conservation Act.

1,5 Salient features of the Act

The Act empowers the Central Government and, in certain cases, State Governments to:

1. Determine energy utilization standards for notified hardware and apparatuses;
2. Directly required showcase of a label on notified hardware and machines;
3. Forbid production, dealing, buying and importing of notified hardware and apparatuses not complying with energy utilization norms;
4. Notify energy-intensive industries, different establishment and commercial structures as assigned consumers;
5. Set up and recommend energy utilization standards and measures for designated consumers;
6. Endorse energy preservation building standards for proficient utilization of energy and its conservation in new commercial buildings having an associated load of 500 kW or a contract demand of 600 kVA or more;
7. Directly assign purchasers to –

- Selected ensured energy administrator responsible for activities for effective utilization of energy and its conservation;
- Get an energy audit conducted to authorize energy evaluator in the predefined way and time frame;
- Furnish data as to energy consumption and steps taken on the suggestion of the authorized energy inspector to the planned organization;
- Comply with energy utilization standards and guidelines;
- Prepare and actualize plans for effective utilization of energy and its preservation if the recommended energy utilization standards and measures are not satisfied.

8. Get an energy audit of the building conducted by a licensed energy auditor in this predetermined way and time periods;

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1,6 State Governments may

1. Alter the energy conservation building codes arranged by the Central Government to suit territorial and neighbourhood climatic conditions;
2. Direct every proprietor or occupier of a new commercial building or building complex, to comply with the provisions of energy conservation building codes;
3. Direct, whenever necessary, about efficient utilization of energy and its conservation, any assigned purchaser to get energy audit conducted by a licensed energy auditor in such way and at such time spans as might be determined.

1,7 Energy conservation act and the way forward

The reservoir of solutions to limitations of the Energy conservation act of 2001 is given in Energy Conservation (Amendment) Bill, 2010. The Bill was presented in the Lok Sabha on March 8, 2010 and amends are based on practical difficulties and encourage implementations.

1. The Energy Conservation Act enables the administration to indicate standards and principles of energy efficiency to be followed by various industries in their utilization of power. Standards and measures of energy efficiency and conservation are likewise to be set for apparatuses and hardware and the development of a building. The Act enables state governments to authorize its different provisions.
2. The Act likewise sets up the Bureau of Energy Efficiency under the central government to determine qualification and certification procedures for energy inspectors and directors who will audit the utilization of energy by enterprises.
3. The Bill grows the extent of energy conservation standards for building and fixes the applicability of energy efficiency standards for apparatuses and gear. It gives a framework within which investment funds on energy use can be exchanged between those ventures who are energy effective and those whose utilization of energy is more than the maximum set by the legislature. The Bill builds punishments for offences and accommodates requests to be heard by the Electricity Appellate Tribunal set up under the Electricity Act, 2003.
4. Under the Act, the administration could specify energy conservation building codes for business structures with an associated load of in excess of 500 kW or agreement request of 600 kVA. The Bill widens the scope of business structures to which such building codes apply to those with an associated load of more than 100 kW or contracted demand of more than 120 kVA.
5. Under the Bill, the central government can give energy saving certificates to those businesses whose energy utilization is not exactly the most extreme permitted. Such authentications can be offered to different shoppers whose utilization is more than the greatest admissible.

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6. The Act enables the legislature to indicate energy utilization standards for gear or machines. The legislature can likewise preclude the assembling, deal, buy or import of informed gear except if they fit in with such standards. Be that as it may, this denial must be given two years after the standards have been determined. The Bill decreases this time period to a half year, extendable by a further half-year.
7. The Bill increases the punishment indicated for offences submitted under the Act. Every offence will result in punishment of Rs 10 lakh (Rs 10,000 prior), with an extra punishment of Rs 10,000 for every day that the offence remains (Rs 1000 prior). The extra punishment, for those enterprises who consume energy in an overabundance of standards, will be the estimation of the excess energy consumed.
8. The Act accommodated the setting up of an Appellate Tribunal for Energy Conservation, which would hear claims against requests of the central or state government. The Bill gets rid of this arrangement and accommodates appeals against such orders to be heard by the appellate tribunal built up under the Electricity Act, 2003.
9. The Bill increases the term of office of the Director-General of the Bureau of Energy Efficiency from three to five years. It accommodates the Bureau, as opposed to the Central Government, to appoint its officials and staff.

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This section describes the energy processes of the facility.

2,1 The facility is an educational institution and energy is consumed in powering the infra of lights, aircon, computers, etc

2,2 Area of plot : 0.5 acres (21,780 sq feet) approximately

No. of floors : ground, mezzanine, 1'st, to 4'th and terrace

2,3 Process at each floor

Ground floor

1. Reception
2. Security
3. Administration office
4. Placement office
5. Board room
6. Director's office
7. Cafeteria
8. Gymkhana
9. Seminar hall / auditorium
10. Green room
11. Sick room
12. Toilets

Mezzanine

1. Department office
2. HOD cabin
3. Open cubicles (13 no.s)

First floor

1. Computer center
2. Classrooms bearing no.s 101, 102 & 103
3. Library and spaces for librarian's desk, photocopier, tea/coffee dispenser, stacker
4. Toilets

Second floor

1. Classrooms bearing no. 201, 202, 204, 206 & 207
2. Room no. 203 includes maintenance section, stores & placement
3. Room no. 205 : examination control office
4. Boys' and Girls' common rooms
5. Toilets

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Third floor

1. Classrooms 301 and 302
2. Part of open terrace housing installation of VRV aircon outdoor units and Solar PV installation
3. Toilets

Fourth floor

1. Part of open terrace
2. Tutorial room (401)
3. Classroom 402
4. Stationary room
5. Cafeteria with spaces for stationary stores, housekeeping & staff pantry

2,4 Energy sources – electrical from Adani Electricity Mumbai Ltd

Verification of tariff plan referred to Electricity bill for dec 2022

A/C no	Meter no	Tariff plan	Contract demand	Area	Max demand recorded	Energy recorded
152630185	L988498	LT IV (A)	63 KVA	Auditorium	40.56 KVA	856 KWh
152630186	L988497	LT IV (A)	94 KVA	All facility except for Auditorium	101.6 KVA	12,633 KWh

Extract of tariff plan

LT IV: Public Services

LT IV (A): LT - Government Educational Institutions and Hospitals

Applicability:

This Tariff category is applicable for electricity supply at Low/Medium Voltage for Educational Institutions, such as Schools and Colleges; Health Care facilities, such as Hospitals, Dispensaries, Clinics, Primary Health Care Centres, Diagnostic Centres and Pathology Laboratories; Libraries and public reading rooms - of the State or Central Government or Local Self-Government bodies such as Municipalities, Zilla Parishads, Panchayat Samitis, Gram Panchayats, etc.;

It shall also be applicable for electricity used for Sports Clubs and facilities / Health Clubs and facilities / Gymnasium / Swimming Pools / Hostels attached to such Educational Institutions / Hospitals, provided that they are situated in the same premises and are meant primarily for their students / faculty/ employees/ patients.

It shall also be applicable for Public Sanitary Conveniences.

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Extracted from Adani Electricity revised tariff plan

6.17 REVISED TARIFFS EFFECTIVE FROM 1 APRIL, 2022 (FY 2022-23)

Sl. No	Consumer Category & Consumption Slab	Fixed/ Demand Charge per month	Energy Charge (Rs/kWh)	Wheeling Charges (Rs / kWh)
(B)	> 20 kW and ≤ 50 kW load	Rs. 355 per kVA	6.00	1.47
(C)	> 50 kW load		6.55	1.47
4	LT III - LT Industry			
(A)	Upto 20 kW load	Rs. 425	5.55	1.47
(B)	Above 20 kW	Rs. 355 per kVA	5.95	1.47
5	LT IV - Public Services			
(A)	Government Hospitals & Educational Institutions	Rs. 425	5.60	1.47

Applicable to PTVA-IM

2,5 Analysis of Energy bill – key parameters referred to bill for dec 2022

Parameters	AC no. 152630185 Auditorium	AC no. 152630186 Rest of the facility
Contract demand	63 KVA	94 KVA
Max demand recorded	40.65 KVA	101.6 KVA*1
Demand / fixed charges per KVA	425 INR	425 INR
Penalty for exceeding MD	0 INR	0 INR
Load factor	0%	0 %
Average PF	0.754 lag	Not indicated
PF penalty	611.44 INR *2	0 INR *3
Energy consumption	856 KWh	12,633 KWh
Energy charges including ToD	5,018.10 INR	73,273.40 INR
Total bill for dec 2022 with other components	10,250 INR	1,33,760 INR

Note :

*1 Contract demand exceeded, recommended to get the contract demand raised, liaise with Adani electricity

*2 Power factor to be improved close to unity to receive incentive and eliminate penalty

*3 PF not indicated, liaise with Adani Electricity

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2,6 Energy performance for last one year

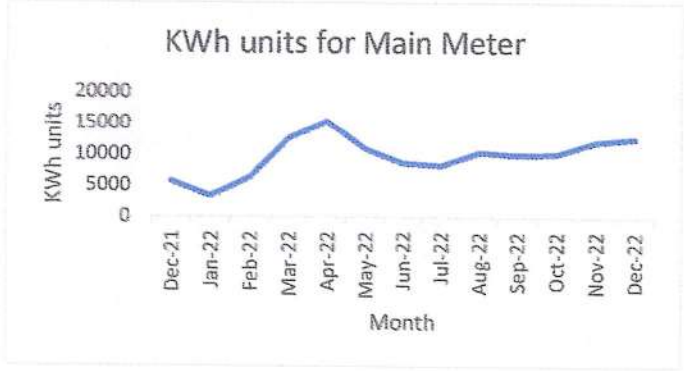
The normal operating hours of the facility are 0830 hours to 2130 hours, Mondays to Saturdays and 0830 hours to 1730 hours on Sundays.

Although all classrooms are not occupied all the days and time, the facility remains loaded in proportion to occupancy

Max occupancy is estimated as 120 students and 45 staff = 165 persons

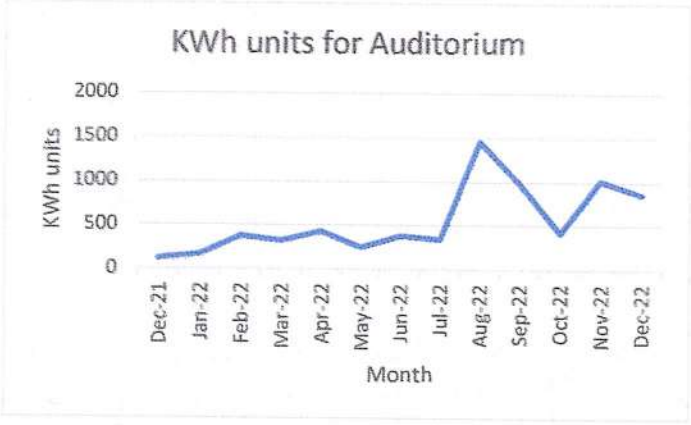
2,6,1 AC no. 152630186 (entire facility except for auditorium)

Historical data of energy consumption (KWh)



2,6,2 AC no. 152630185 (only auditorium)

Historical data of energy consumption (KWh)



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3,1 Energy Performance

3,1,1 Comfort Aircon-VRV

Finding

By design, the facility has chosen VRV aircon for comfort cooling.

With intelligent controller, the DBT at conditioned spaces is automatically maintained at 24 deg C +/- 1 deg C which is optimum.

The Installation of ODUs was found to be satisfactory with adequate space for heat dissipation.

IDUs were mainly ceiling mounted cassette units and a few hi wall units.

Energy performance of VRV aircon is superior in the sense that it reduces the max demand and continuously adjusts loading based on changes in heat load of the conditioned space.

As aircon is the major energy consumer, the VRV aircon is the best energy saving measure is already in place.

Recommendation

In order to upkeep the performance of aircon, it is recommended to

Clean air filters and cooling coils in IDUs once in a month

Clean condenser coils in ODUs once in a month

Set optimum temp set points at various cooling / comfort zones

Expected energy saving : 2 to 3 %

3,1,2 Comfort aircon – Dx for auditorium

Finding

The energy meter for auditorium is separate and the aircon used in Dx (non VRV) which is less efficient and can not control max demand.

However, since auditorium is not frequently used and remains in use for shorter duration, replacing the existing Dx aircon with VRV is not recommended due to poor cost to benefit ratio.

In order to upkeep the performance of aircon, it is recommended to

Clean air filters and cooling coils in IDUs

Clean condenser coils in ODUs

Set optimum temp set point at 24 deg C

Install energy saving controller

Expected energy saving : 10 to 15%

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3,1,4 Aircon for Mezzanine

Arrangement of Mezzanine is such that the aircon at various cubicles also cool the air column from ground floor. This amounts to some wastage of cooling and mixing with open air column needs to be minimized.

Expected saving : 5 to 10%

3,1,5 Power factor correction

Power factor could be improved by installation of power factor correction capacitors of small denominations such as 1, 2, 3, 5 KVAr to improve PF close to unity and avoid penal charges from electricity bill as well as receive incentive.

However, cost to benefit ratio will be poor.

3,1,6 Illumination

Most of the luminaries comprise of electromagnetic chokes (FTL) and smaller fitting of CFL.

It is recommended to replace the FTL with 22 watt LED tube lights and CFL with 8 or 12 Wall LED fittings whenever these fail.

Expected energy saving 20 to 30% in the lighting energy consumption.

3,1,7 Solar powered lighting

Solar powered peripheral lighting is provided with arrangement of solar PV and batteries

It was reported that the back up remained for 5 to 6 hours and was satisfactory.

3,1,8 Grid synch solar PV with net metering

It is recommended to consider grid synched solar PV which can considerably reduce the electricity bill thru net metering. Option of Capex based model will be beneficial with subsidy from Government.

Alternately, Opex based model will help reduce energy bill without requirement of major investment.

Customer has substantial size of open terrace and a feasibility survey may be conducted

3,1,9 Energy Management System (EnMS)

The facility may benefit from monitoring key locations of energy consumption such as aircon and other area that have movement of occupants

Energy management system can help identify idle areas and compute area specific consumption which can further help in reducing energy usage.

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3,2 Summary of energy saving opportunities and simple payback calculations

Sr	Description	Method	Investment	Saving	Simple payback
1	VRF aircon	Improved frequency of cleaning of ODUs and IDUs	INR 25,000 per year recurring	INR 50,000/- per year	6 months
2	Conventional aircon for auditorium	Improved frequency of cleaning of ODUs and IDUs and use of electronic energy saver	INR 45,000/- one time	INR 25,000/- per year	22 months
3	Power factor correction	Install APFC	INR 60,000/- one time	INR 12,000/-	5 years
4	Indoor lighting	Replace with LED	INR 2,50,000/- one time	INR 75,000/-	3 YEARS & 4 MONTHS
5	Solar PV	20 KW peak Solar PV with net metering	INR 7,00,000/-	INR 1,65,000	Over 4 years

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Deskphone : +91-22-49767603, www.psienergyinfra.com

Date : 21-dec-2021

Kind Attn : Dr Harish Kumar S. Purohit, Director

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Thanking you

Yours truly

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