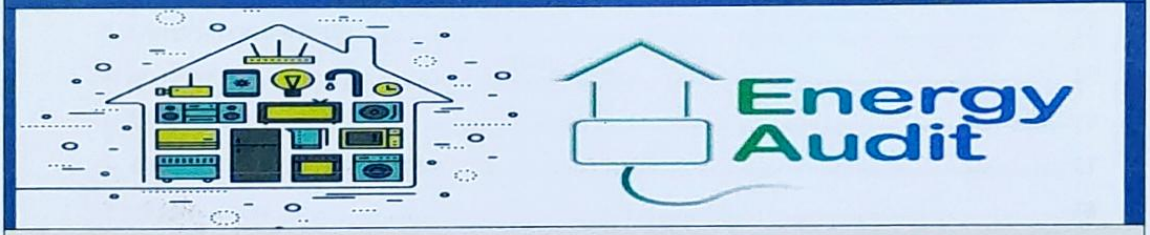

ENERGY AUDIT REPORT

2022-23

PREPARED BY

GREEN INDIA MISSION, PATNA

POWERED BY LOK SEWA SANGH, PATNA

Badri Narayan Mukteshwar College, Barhiya

(A Constituent Unit of Munger University, Munger-Bihar)

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GREEN INDIA MISSION ESTD-2017 PATNA (BIHAR)

Ramesh Kumar
08.05.2024

IQAC
Co-ordinator
B.N.M. College, Barhiya

Registration No. 981/2003-04

Green India Mission

let's go green

(Running under Lok Sewa Sangh, Patna, Bihar)
Registration under the Societies Registration Act 21, 1860 with government of Bihar

Audit Certificate

Badri Narayan Mukteshwar College, Barhiya

Barhiya, Lakhisarai, Bihar - 811302
(A Constituent Unit of Munger University, Munger-Bihar)

Has been assessed by Green India Mission, Patna for the comprehensive study of Energy Audit on institutional working framework to fulfill the requirement of

ENERGY AUDIT

ACADEMIC YEAR 2022-23

The energy-saving initiatives carried out by the institution have been verified in the report submitted and were found to be satisfactory.

The efforts taken by the management and the faculty towards all type of energy used in the institution and sustainability are appreciated and noteworthy.

The institution is credited with score 8.72/10 Certificate No. GIM/ERA/28/2022-23

8/5/24

Expert Auditor
BEE & BIS Certified Auditor
UIN: EM-7832 SIM - 14231

President
Green Indian Mission, Patna
President
Green India Mission
Patna (Bihar)

General Secretary
General Secretary
Green India Mission
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ACKNOWLEDGEMENT

Green India Mission, Patna would like to thank the management of Badri Narayan Mukteshwar College, Barhiya for assigning this important work of Energy Audit. We appreciate the co-operation to the teams for completion of assessment.

First of all, we would like to thank ***Dr. Ashutosh Kumar – Principal and Dr. Ramesh Kumar, IQAC Co-ordinator*** for giving us an opportunity to evaluate the environmental performance of the campus.

We would also like to thank ***Dr. Abhimanyu Kumar, Audit Co-ordinator***, for his/her continuous support and guidance, without which the completion of the project would not have been possible. We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.

We are also thankful to

1. ***Dr. Anandi Kumar***
2. ***Dr. Murlidhar Prasad Singh***
3. ***Dr. Pramod Yadav***
4. ***Mr. Chunnu Kumar***

GREEN INDIA MISSION ESTD. 2017 PATNA (BIHAR)

Dr. Arvind Kumar Singh
BEE & BIS Certified Auditor
ID No.EM-7059/2017 SIM-14595

General Secretary
Green India Mission, Patna

General Secretary
Green India Mission
Patna (Bihar)

DISCLAIMER

Green India Mission Energy Audit Team has prepared this report for the institution based on data submitted by the representatives of college complemented with the best judgment capacity of the expert team.

While all sensible care has been taken in its preparation, details contained in this report have been compiled in good faith based on information gathered.

It is further informed that the conclusions are arrived following best estimates and no representation, warranty or undertaking, express or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any useof the information, statements or forecasts in the report.

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GREEN INDIA MISSION ESTD.-2017 PATNA (BIHAR)

Dr. Arvind Kumar Singh
BEE & BIS Certified Auditor
ID No.EM-7059/2017 SIM-14595

08/03/2024
General Secretary
Green India Mission, Patna

General Secretary
Green India Mission
Patna (Bihar)

ABBREVIATION

A	Amps
AC	Air Conditioner
AC	Alternating Current
AMET	Academy of Maritime Education and Training
CFL	Compact fluorescent lamp
CIP	Comprehensive Inspection Programme
DC	Direct Current
HSD	High Speed Diesel
Hz	Hertz
kg	Kilogram
kVA	kilo-volt-ampere
kW	kilo Watts
kWh	kilowatt hour
kWp	Kilowatt peak
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas
MMS	Module mounting structure
MPPT	Maximum Power Point Tracker
NAAC	The National Assessment and Accreditation Council
SEC	Specific Energy Consumption
SPV	Solar Photovoltaic
STC	Standard Test Condition
TV	Television
V	Volts
W	Watts
W/m2	watt per square metre

OVERVIEW OF THE COLLEGE

The Institution is a constituent unit of Munger University, Munger, Bihar. It was established in the year 1958. The college possesses a campus of 2.425 acre and bulid up area 3810.67 sq.mts. with a student strength of 1501 and 16 strong core faculty members along with visiting / guest faculties along with guest faculties located in the rural area Barhiya, Lakhisarai. The College was born out of a vision to address the critical need for qualified educators and to provide a platform for quality education. The founders envisioned an institution that would not only impart academic knowledge but also instill values of social responsibility, ethical conduct, and community service among its students.

As an institution of learning it has a commanding presence both in the University as well as in the capital of the state while maintaining its exemplary record in University examinations.

GREEN INDIA MISSION ESTD.-2017 PATNA (BIHAR)

MISSION

- The college aims to foster intellectual curiosity and the pursuit of knowledge within an atmosphere of academic freedom.
- This mission is deeply imbued in the institution's daily activities, encouraging students to interact freely with faculty members and seek their counsel as needed.

VISION

- The vision of the college is to shape young minds with a spirit of creativity, tolerance, and scientific temper.
- This vision is aimed at equipping students to cope with the changing needs of society and the economy.
- Post-independence, the institution was driven by noble thinkers who sought to uplift the ecological and educational standards of the Barhiya village and its surrounding areas.
- The visionary efforts of late Gopeshwar Pd. Singh, a freedom fighter and landlord of the region, were crucial in establishing this co-educational institution.
- His goal was to associate the vast rural population with the power of knowledge, contributing to the literacy and development of the nation

Classroom

Laboratory

Canteen

AUDIT PARTICIPANTS

On behalf of Instituion Administration

Name	Designation
Dr. Ashutosh Kumar	*Principal*
Dr. Abhimanyu Kumar	*Audit Coordinator*
Dr. Anandi Kumar	*Member*
Dr. Murlidhar Prasad Singh	*Member*
Dr. Pramod Yadav	*Member*
Mr. Chunnu Kumar	*Member*

On behalf of Green India Mission

Name	Position	Qualifications
Dr. Arvind Kumar Singh	**BEE & BIS Certified Auditor**	*Ph.D., MSc. (Environment & Management)*
Dr. Mirza H. Abbas	**Co-Auditor**	M.Sc. (Physics), Field Expert

GREEN INDIA MISSION ESTD. 2017 PATNA (BIHAR)

Ramesh Kumar
08.05.2024
IQAC
Co-ordinator
B.N.M. College, Barhiya

EXECUTIVE SUMMARY

The purpose of this Energy Audit was to seek opportunities to improve the energy efficiency of the Institution. Reducing the energy consumption despite improving the human comfort, health and safety were of primary concern.

Beyond just identifying the energy consumption pattern, this audit sought to detect and categorize the most energy efficient appliances. Additionally, some daily practices relating common appliances have been shared which may help reducing the energy consumption. Data collection for energy audit of the campus was carried out by the GREEN INDIA MISSION Team. The Energy Audit Report accounts for the energy consumption patterns of the institution on actual survey and detailed analysis during the audit.

The work comprehends the area wise consumption computed using suitable equipment. The analysis was carried out by our team with the support of the staff members from Institution. The report provides a list of possible actions to preserve and efficiently access the available source, resources and their saving potential was also identified. We look forward towards optimization

that the authorities, students and staff members would follow the recommendations in the best possible way. The report is based on certain generalizations including the approximations wherever necessary. The views conveyed may not reveal the general opinion. They merely represent the opinion of the team guided by the interviews of clients. We are happy to submit this Energy audit report to the Institution.

ENERGY AUDIT - ANALYSIS

1. ENERGY CONSUMPTION

To understand the Energy Consumption trends and to analyze the average monthly consumption we have collected electricity energy bills from July 2022 to June 2023

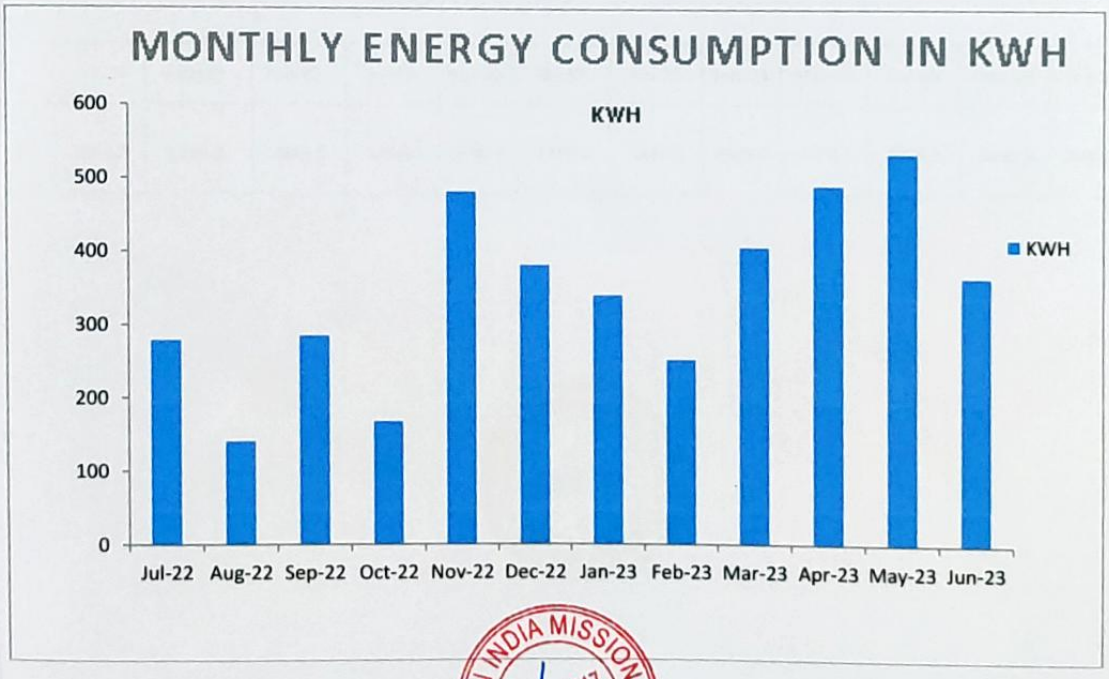
The details of **"Meter Connection"** at Institution are as follows-

Name	-	100139091
CA No.	-	THE PRINCIPAL

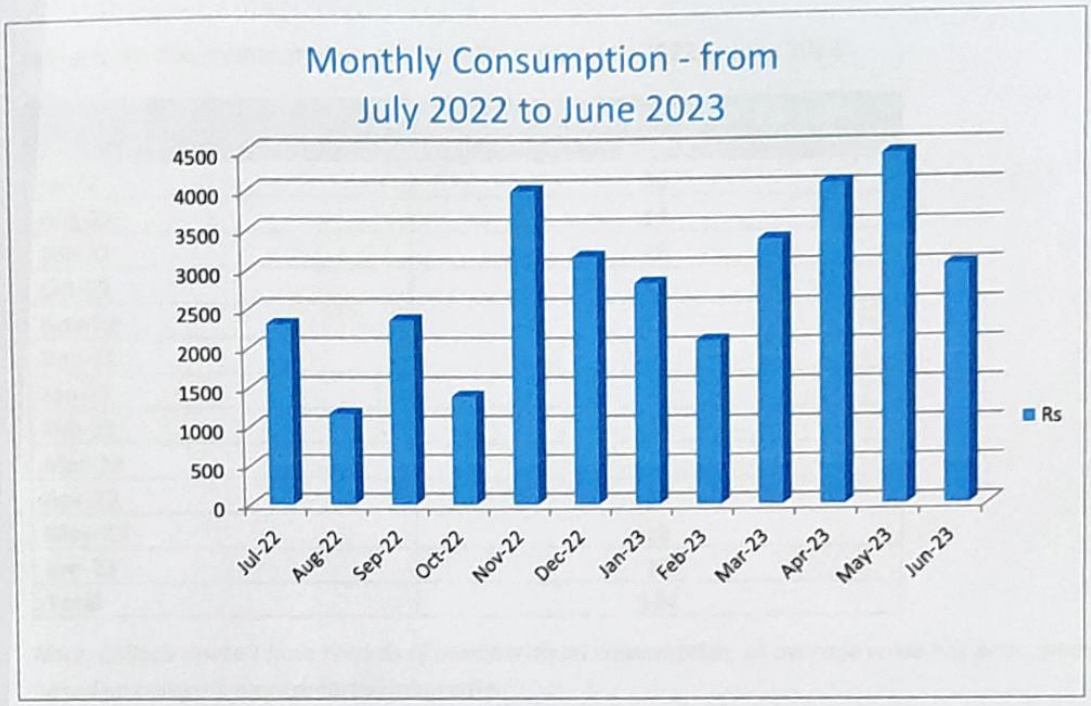
1.1 Summary of Monthly Electricity Consumption and Total Bill Amount

To understand the Energy consumption trend and to develop the baseline parameter we have collected monthly energy bills for the 12 months i.e. from July 2022to June 2023.

Month	CA No. 100139091 Total Readings	Rate INR	Amount inINR
Jul-22	279	8.30	2315.7
Aug-22	141	8.30	1170.3
Sep-22	285	8.30	2365.5
Oct-22	168	8.30	1394.4
Nov-22	482	8.30	4000.6
Dec-22	382	8.30	3170.6
Jan-23	341	8.30	2830.3
Feb-23	253	8.30	2099.9
Mar-23	407	8.30	3378.1
Apr-23	491	8.30	4075.3
May-23	535	8.30	4440.5
Jun-23	366	8.30	3037.8
Total	**4130**		**55634.9**



GREEN INDIA MISSION ESTD.2017 PATNA (BIHAR)



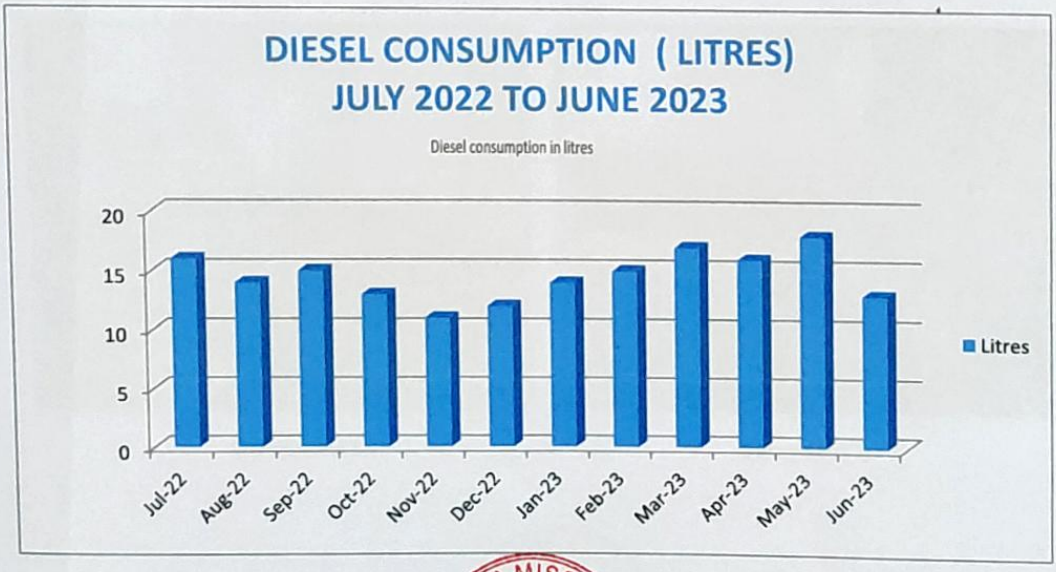
	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
Rs	**2315.7**	**1170.3**	**2365.5**	**1394.4**	**4000.6**	**3170.6**	**2830.3**	**2099.9**	**3378.1**	**4075.3**	**4440.5**	**3037.8**

2. DIESEL CONSUMPTION

Below is the diesel consumption details in litres from July 2022 to June 2023.

Period	Diesel consumption (in litres)
Jul-22	16
Aug-22	14
Sep-22	15
Oct-22	13
Nov-22	11
Dec-22	12
Jan-23	14
Feb-23	15
Mar-23	17
Apr-23	16
May-23	18
Jun-23	13
Total	**174**

Note: College doesn't have records of monthly diesel consumption, so average value has been taken based on college's representative suggestion



GREEN INDIA MISSION ESTD.-2017 PATNA (BIHAR)

3. ANALYSIS OF DG SETS

In the campus, there are one Diesel Generator (DG) set for its electrical power needs in case of Grid power failure. DG set capacity is 62.5 kVA.

DG Set Design Details			
Description	*Unit*	*DG 1 at Station*	*DG 2 at Station*
Rated capacity	kVA	10	25
Hz		50	125
Sl No.		4DM180/2	KG 30 WS5
Make		Kirloskar Electric Co. Ltd	Kirloskar Oil Engine Limited
Rated Power	kW	8	25
PF		0.8 Cos	0.8 Cos
Phase		01 Phase	01 Phase
Noise Limit		75 db	95 db
Amps	Amps	20.9	32
Mfg.		2007	2012

Generator 1

Generator 2

DG Set Operation details		DG Set 1	DG Set 2
Operating hours during testing	Hours	0.50	0.50
% Loading	%	21.12	66.54
Energy Generation	kWh	08	25
Load	kVA	10	25
Fuel consumption during testing	Litre	06	10
Specific energy generation	kWh/litre	3.17	3.17

Observation and Suggestions: -

Soundproof silent generators are an efficient tool to keep both noise and vibration at low levels. For this purpose, the power backup of the institution, the soundproof model is installed.

As per the trial taken during the energy audit the percentage loading of DG set-1 is 21.12% and DG set-2 66.54% which is ok and specific energy generation of DG Sets 3.17 kWh/Liter which is satisfactory because as per manufacturer recommendation, best practices for SEC in DG sets range from 3.0 to 3.5 kWh/Litre and above.

We recommend college to initiate periodic maintenance schedule and monitoring of DG set through authorized lab.

4. AC SYSTEM

Energy Efficiency Ratio (EER): Performance of smaller chillers and ground floor units is frequently measured in EER rather than kW/ton. EER is calculated by dividing a chiller's cooling capacity (in Btu/h) by its power input (in watts) at full-load conditions.

There are 02 ACs installed in the Institution in various areas of various capacity the detail is given below:-

Location	Number of AC
Principal chamber	01
Staff room	01
Total	**02**

Remarks: - We have checked Energy Efficiency Ratio of AC's and EER of AC's is fairly OK. But in future you should purchase 3-Star rated inverter based split AC's because power consumption of Inverter based BEE 3-Star rated AC's is less than non-star rated AC's.

We recommend Institution to organize periodic maintenance schedule and take corrective actions for insulating of AC's refrigerant lines in order to protect energy losses.

GREEN INDIA MISSION ESTD. 2017 PATNA (BIHAR)

5. FANS ANALYSIS

In the Institution, there are 51 fans installed. The observation and suggestionare given below.

Fans wattage	Count
Ceiling Fan-	51
Halogen Bulb	02
Bulb Led	96
Tube light	26
Total	**175**

Observation and Suggestions: -

In the college, all the ceiling fans are of 60 W but BEE 5 Star Rated of 30W Ceiling Fans are present in the market. We recommend replacement to BEE 5 Star rated 30W fans and halogen bulb in to LED bulb.

Note: - Energy saving will increase or decrease if operating hours of machine /equipment will be increased or decreased and payback period will also increase or decrease if cost of investment (Cost of machine/equipment/accessories of machine) will increase or decrease because cost of investment is taken on tentative basis.

6. ANALYSIS OF LIGHTING SYSTEM

Lights type (based on wattage)	Count
18W LED Light	60
12 W LED Light	12
36W LED Light	24
36W Tube light	26
100W Halogen Bulb	02
Total	**124**

Lux Measurement

Description	Lux	Remark
Class Rooms	120 to 235	Acceptable
Offices	130 to 240	Acceptable
Corridors	35 to 90	Acceptable
Washrooms	45 to 76	Acceptable
Outdoor	36 to 95	Acceptable
Computer Lab	150 to 289	Acceptable
Parking area	45 to 94	Acceptable
Canteen	69 to 185	Acceptable

7. OBSERVATION

The Institution has initiated LED based lighting solution, but still there are 26 (36W) tube lights. LEDs save energy, the life span is much greater and emit virtually no heat. We recommend to replace the tube lights with LEDs.

Additionally, we recommend to install motion sensor-based lights in common areas such aslibrary, washrooms, corridors, etc.

We also recommend to use solar lights for open areas like parking, ground, street lights, etc.Table below shows the performance characteristics comparison of all luminaries.

Table - Luminous Performance Characteristics of Commonly Used Luminaries

Type of Lamp	Lumens/Watt		Colour Rendering Index	Typical Application	Typical Life
	Range	Avg.			
Incandescent	8-18	14	Excellent (100)	Homes, restaurants, general lighting emergency lighting	1000
Fluorescent lamps	46-60	50	Good w.r.t coating (67-77)	Offices, shops, hospitals, homes	5000
Compact fluorescent Lamps (CFL)	40-70	60	Very Good (85)	Hotels, shops, homes, offices	8000-10000
High pressure mercury (HPMV)	44-57	50	Fair (45)	General lighting in factories, garages, car parking. flood lighting	5000
Halogen lamps	18-24	22	Excellent (100)	Display, flood lightening, stadiumexhibition grounds, construction areas	2000 - 4000
High pressure sodium (HPSV) SON	67-121	90	Fair (22)	General lighting in ware houses, factories, street lighting	6000 - 12000
Low pressure sodium (LPSV) SOX	101-175	150	Poor (10)	Roadways, tunnels, canals, street lighting	6000 - 12000
Metal halide lamps	75-125	100	Good (70)	Industrial bays, spot lighting, flood lighting, retail stores	8000
LED Lamps	30-50	40	Good (70)	Reading lights, desk lamps, night lights, spotlights, security light signage lights, etc.	40000 - 100000

8. OTHER POWER CONSUMPTION

Inventory of IT Infrastructure

Device Type	Count
Printer	06
Computer	12
Camera	16
Telephone	01
Television	01
Inverter	02
Interactive Board	02
Projector	01
Podium	01
Refrigerator	01
Total	**43**

Water pump details

Sr. No.	Description	Unit	Pump No.-1
1	Rated Power of Motor	KW	1 HP
2	Motor Eff.	%	0.8
3	Discharge Head	m	70
4	Suction Head	m	650
5	Pump Type	Type	Submersible

Exhaust fan details

Device Type	Count
Air Purifier/ Cooler	1/1
Water Purifier/ Water Cooler	02
Refrigerator 1000w	01
Exhaust Fan	01
Total	**06**

ANALYSIS

There should be regular maintenance schedule of equipment like pumps, exhaust fans and IT equipment. Electronics such as computers, printers, scanners, etc. more than 3 year or 5years (as per their life) should be replaced with new computers/laptops. Ideal Temperature should be maintained for all electronic appliances.

Note : Needs to be Implement Solar Panel.

***** **END OF THE REPORT** *****

GREEN INDIA MISSION * ESTD:2017 * PATNA (BIHAR)

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