Nutan Urja Solutions

A 703, Balaji Witefield, Near Sunni's World,
Sus Road, Sus, Pune 411 021
Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 11/08/2024

CERTIFICATE

This is to certify that we have conducted Energy Audit at D Y Patil International University Akurdi, Pune as per the guidelines of Maharashtra Energy Development Agency (www.mahaurja.com) in the year 2023-24.

The University has already adopted **Energy Efficient** practices like:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of **350 kW** Roof Top Solar PV Power Plant.

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

Nutan Urja Solutions,

K G Bhatwadekar,
Certified Energy Auditor,
EA - 22428

Report

On

Energy Audit

At

D. Y. Patil International University

Akurdi,Pune

(Year 2023-24)

D Y PATIL
INTERNATIONAL
UNIVERSITY
AKURDI PUNE

Prepared by

Nutan Urja Solutions

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Nutan Urja Solutions

Contents

Acknowledgement 2

Executive Summary 3

Abbreviations 5

1. Introduction 6

1.1 Objectives 6

1.2 Audit Methodology: 6

1.3 General Details of University 6

2. Study of connected load 7

3. Study of Electrical Energy Consumption 14

4. Carbon Foot printing 16

5. Study of usage of alternate energy 18

6. Study of usage of LED lighting 19

7. Energy conservation proposals 20

7.1 Installation of Solar PV panel 20

7.2 Summary of Savings 21

Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of D Y Patil International University Akurdi, Pune for awarding us the assignment of Energy Audit of their university premises.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures through energy savings. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO_2 emissions. university consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

1. Present Energy Consumption

In the following Table, we present the details of Energy Consumption.

Table no 2.1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	69,103	55.28
2	Minimum	-	-
3	Average	40,270	32.22
4	Total	4,83,241	386.59

2. Energy Conservation Projects already installed

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at indoor locations
3. Usage of LED Lights for outdoor lighting.

3. Key Observations

1. Usage of LED lights.
2. Usage of star rated equipment.
3. Maintained a good power factor.

4. Percentage of Usage of Alternate Energy

The university has installed a Roof Top Solar PV Plant. The percentage of usage of Alternate Energy to Annual Energy Requirement is 52 %.

5. Percentage of Usage of LED Lighting

The university has various Types of Light fittings. The percentage of Annual LED Lighting Usage to Annual Lighting requirement works out to be 100 %.

6. Recommendations

Table no 1: Recommendations for energy savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Installation of 150kW grid connected PV panel	225,000	2,475,000	7,500,000	36
	Total	225,000	2,475,000	7,500,000	36

7 Notes & Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-300 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

Nutan Urja Solutions

Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

66	Room no 405	**3**		2
67	Room no 406	**1**		5
68	Room no 407	**6**		2
69	Room no 408	**6**		2
70	Room no 409	**10**		4
71	Room no 410	**3**		2
72	Room no 411	**2**		1
73	Room no 412	**2**		1
74	Room no 413	**9**		2
75	Room no 414	**11**	4	5
76	Room no 415		13	
77	Room no 416	**2**		1
78	Room no 417	**2**		1
79	Room no 418	**2**		1
80	Room no 419		13	1
81	Room no 420	12		4
82	Room no 421	16		6
83	Room no 422	2		1
84	Room no 423	2		2
85	Room no 424	1		1
86	Room no 425	1		1
87	Room no 426	1		1
88	Room no 427	1		1
89	Room no 428	1		1
90	Room no 429	2		1
91	Room no 430	13		6
92	Room no 431	8	4	4
93	Room no 432	13		
94	Room no 433	6		
95	Room no 434	3		
96	Room no 435	4		
97	Room no 436	4		
98	Room no 437	6		
99	Room no 438	6		
100	Room no 439	8		
101	Room no 440	14		
102	Room no 441		4	1
103	Room no 442		4	1
104	Room no 443		4	1

1. Introduction

D. Y. Patil International University, Akurdi, Pune (DYPIU) has recently become operational as a State Private University and has rolled out with a fundamental mission of covering a remarkable milestone in the history of Higher Education in India. It further aims to convert itself into a Private University of global value by developing socially relevant and contemporary outcome-based programs, carrying out inter and intra disciplinary research in thrust areas, enhancing the scope of collaborations for research, and boosting faculty and student exchange programs worldwide. Also, by its acute focus on empowerment through Education and Academic Excellence, it aspires to provide an inspirational and experiential learning environment for its stakeholders and is also keenly responsive towards serving the prerequisites of the Industry and society by embedding internationalization, employability and value ruminating in all its programs.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study Electrical Consumption
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study various measures to reduce the Energy Consumption

1.2 Audit Methodology:

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

1.3 General Details of University

Table No-1.1: Details of university

No	Head	Particulars
1	Name of Institution	D Y Patil International University Akurdi, Pune.
2	Address	Padmashree D. Y. Patil Educational Complex, Sector 29, Nigdi, Akurdi, Maharashtra 411044

2. Study of connected load

In this chapter, we present details of various connected electrical equipment and electrical load.

Table No-2.1: Location wise study of Electrical fittings in various buildings

No	Location	LED tube (20W)	LED Down light (12W)	Fans
	Third Floor			
1	Room 301		4	1
2	Room 302		4	1
3	Room 303		4	1
4	Room 304		4	1
5	Room 305	4	4	1
6	Room 306	17		5
7	Room 307	2		
8	Room 308		8	
9	Room 309		8	1
10	Room 310		8	1
11	Room 311		8	1
12	Room 312		7	
13	Room 313	16		5
14	Room 314	4	3	2
15	Room 315	4		1
16	Room 316	3		2
17	Room 317	2		
18	Room 318	2		
19	Room 319	1		
20	Room 320	1		
21	Room 321	2		
22	Room 322	11	3	6
23	Room 323	1	1	
24	Room 324	12		4
25	Room 325	12		6
26	Room 326	7		2
27	Room 327	12		2

28	Room 328	12		3
29	Room 329	12		3
30	Room 330	12		3
31	Room 331	12		3
32	Room 332	12		3
33	Room 333	12		3
34	Room 334	10		4
35	Room 335	3	3	2
36	Room 336	3	3	2
37	Room 337	2	9	1
38	Room 338	6	6	2
39	Room 339	6	6	2
40	Room 340	10		4
41	Room 341	16	22	5
42	Room 342		4	
43	Room 343		4	
44	Room 344		4	
45	Room 345		4	
46	Room 346	7	6	
47	Room 347		6	
48	Room 348		4	1
49	Room 349		4	1
50	Room 350		4	1
51	Room 351		4	1
52	Room 352		4	1
53	Room 353	6	9	6
54	Room 354	5		2
55	Room 355	4	4	2
56	Room 356	7	10	3
57	Room 357		8	
58	Library	13	24	14
59	Wash Rooms	23		
60	Boys Room	5		2
61	Passage	68		
	Fourth Floor			
62	Room no 401		4	2
63	Room no 402		4	
64	Room no 403		4	
65	Room no 404		4	

105	Room no 444		4	1
106	Room no 445	6	4	4
107	Room no 446	6		2
108	Room no 447		4	1
109	Room no 448		4	1
110	Room no 449	8	3	3
111	Room no 450	12		5
112	Room no 451	1		1
113	Room no 452	1		2
114	Room no 453	2		1
115	Room no 454	1		1
116	Room no 455	1	1	1
117	Room no 456	1		1
118	Passage	62	90	
119	Wash Rooms	18		
	Fifth Floor			
120	Roo no 501		5	1
121	Roo no 502		5	1
122	Roo no 503		5	1
123	Roo no 504		5	1
124	Roo no 505		5	1
125	Roo no 506		5	1
126	Roo no 507		6	1
127	Roo no 508		6	1
128	Roo no 509		5	1
129	Roo no 510		5	1
130	Roo no 511		5	1
131	Roo no 512	8		4
132	Roo no 513	8		4
133	Roo no 514	9	8	8
134	Roo no 515			4
135	Roo no 516		4	1
136	Roo no 517		4	1
137	Roo no 518	8		4
138	Roo no 519		4	1
139	Roo no 520		4	1
140	Roo no 521		4	1
141	Roo no 522		4	1
142	Roo no 523	14		10

143	Roo no 524		4	1
144	Roo no 525	8		4
145	Roo no 526	8		4
146	Roo no 527		4	1
147	Roo no 528		4	1
148	Roo no 529	11		4
149	Roo no 530	12		4
150	Roo no 531	8		4
151	Roo no 532	8		4
152	Roo no 533	8		3
153	Roo no 534	8		3
154	Roo no 535	8		3
155	Roo no 536	8		3
156	Roo no 537	8		3
157	Roo no 538	8		3
158	Roo no 539	8		3
159	Roo no 540	8		3
160	Roo no 541		4	1
161	Roo no 542		4	1
162	Roo no 543		4	1
163	Roo no 544	12		
164	Roo no 545	12		
165	Roo no 546	8		
166	Roo no 547		4	1
167	Roo no 548		4	1
168	Roo no 549		4	1
169	Roo no 550		4	1
170	Roo no 551	8		4
171	Roo no 552		11	1
172	Roo no 553		11	1
173	Roo no 554		4	1
174	Roo no 555		4	1
175	Roo no 556		4	1
176	Roo no 557		4	1
177	Roo no 558		4	1
178	Roo no 559		4	1
179	Roo no 560		4	1
180	Roo no 561		4	1
181	Roo no 562		4	1

182	Roo no 563		4	1
183	Roo no 564		6	1
184	Roo no 565		6	1
185	Roo no 566	15		10
186	Roo no 567		6	1
187	Roo no 568		6	1
188	Roo no 569		6	1
189	Roo no 570		6	1
190	Roo no 571		6	1
191	Roo no 572		6	1
192	Roo no 573		6	1
193	Roo no 574	1		1
194	Roo no 575	15		10
195	Canteen	8		2
196	Wash Rooms	23		
197	Passage	68		2
	Total	**1017**	**635**	**364**

Apart from above load, the university has pumps, street lights. Individual fitting wise load is as under.

Table No 2.2: Equipment wise Connected Load

No	Equipment	Qty	Load, W/Unit	Load, kW
1	LED Tube-20W	1017	20	20.3
2	LED down lights	635	12	7.6
3	Computers	349	65	22.7
4	Ceiling Fan	364	65	23.7
5	AC (10Tr)	50	13000	650.0
6	LED focus Street light	7	35	0.2
7	Pumps (2 nos 5HP)			7.5
	Total			**681.4**

Data can be represented in terms of PIE chart as under,

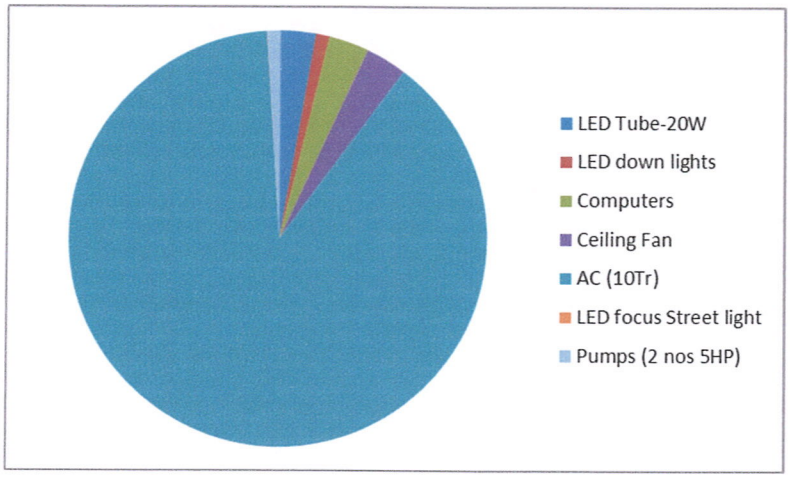

Figure 2.1: Distribution of connected load.

3. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption. D Y Patil International University Akurdi, Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Complex is having single energy meter for all institutes situated in complex. The bill analysis is carried for electricity bills of entire campus.

Table no 3.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-24	-	3,07,440
2	May-24	44,035	25,72,781
3	Apr-24	69,103	13,22,065
4	Mar-24	49,745	9,73,997
5	Feb-24	44,372	8,95,288
6	Jan-24	40,320	8,31,398
7	Dec-23	35,398	7,68,080
8	Nov-23	43,545	8,80,689
9	Oct-23	51,310	9,41,977
10	Sep-23	39,228	7,72,778
11	Aug-23	37,536	7,39,307
12	Jul-23	28,649	6,17,114
	Total	**4,83,241**	**1,16,22,914**

Variation in energy consumption is as follows,

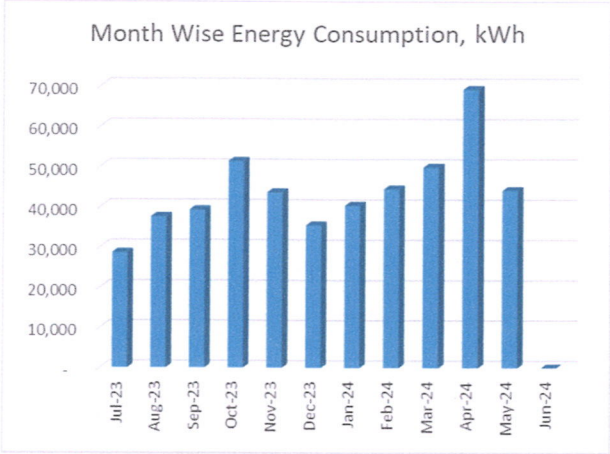

Figure 3.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

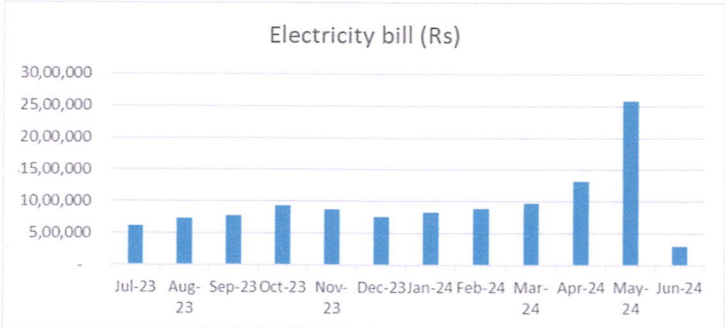

Figure 3.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 3.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	69,103	55.28
2	Minimum	-	-
3	Average	40,270	32.22
4	Total	4,83,241	386.59

4. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the university for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere.

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the university due to its Day to Day operations.

D Y Patil International University Akurdi, Pune is situated in Padmashree Dr D. Y. Patil Educational Complex. Entire Educational Complex is having single energy meter for all institutes situated in complex. Calculation for CO_2 emissions due to Electrical Energy is carried for entire campus.

We herewith furnish the details of various forms of Energy consumption as under

Nutan Urja Solutions

Table 4.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-24	-	0.00
2	May-24	44,035	35.23
3	Apr-24	69,103	55.28
4	Mar-24	49,745	39.80
5	Feb-24	44,372	35.50
6	Jan-24	40,320	32.26
7	Dec-23	35,398	28.32
8	Nov-23	43,545	34.84
9	Oct-23	51,310	41.05
10	Sep-23	39,228	31.38
11	Aug-23	37,536	30.03
12	Jul-23	28,649	22.92
	Total	**4,83,241**	**386.59**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

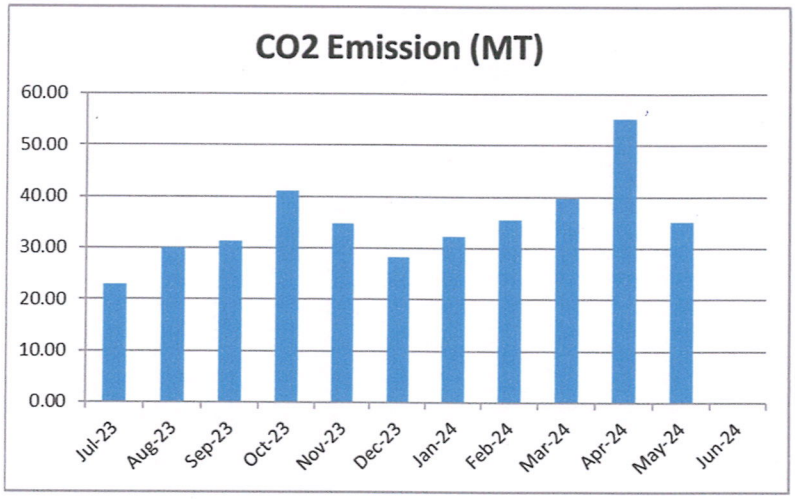

Figure 4.1: Month wise CO2 Emission

5. Study of usage of alternate energy

In this Chapter, we compute the percentage of Usage of Alternate/Renewable Energy to Annual Energy Requirement of the university.

The D Y Patil International University Akurdi, Pune is situated in Padmashree D. Y. Patil Educational Complex. Entire Complex is having single energy meter for all institutes situated in complex. The institute have installed Roof Top Solar PV System to cater energy requirement of all institutes of entire campus. The Installed Capacity of Solar PV Plant is **350 kWp.**

Table 5.1: Computation of % Usage of Alternate Energy to Annual Energy Requirement

No	Particulars	Value	Unit
1	Annual Energy Purchased from MSEDCL	4,83,241	kWh/Annum
2	Energy Generated by Roof Top Solar PV System	5,25,000	kWh/Annum
3	Total Energy Requirement of university	10,08,241	kWh/Annum
4	% of Usage of Alternate Energy to Annual Energy Requirement	52	%

Photograph of Solar PV plant

6. Study of usage of LED lighting

In this chapter we study the lighting system of university and compute the percentage of total load catered by LED lighting.

Table 6.1: Total lighting load

No	Particulars	Qty	Load, W/Unit	Load, kW
	LED lighting load			
1	LED tube	1017	20	20.3
2	LED Down lights	635	12	7.6
3	LED street lights	7	35	0.2
	Total LED lighting load			**28.2**
	Total Lighting load			**28.2**

It can be seen that out of total lighting load 100% load is LED lighting load.

7. Energy conservation proposals

7.1 Installation of Solar PV panel

It is recommended to install 150 kW solar PV panel. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Installation of 150kW PV unit	150	kW
2	Energy saving	225000	kWh/Annum
3	Rate of electrical energy	11	Rs
4	Annual monetary savings	2475000	Rs/ Annum
5	Investment required	7500000	Rs lump sum
6	Simple payback period	36	Months

7.2 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 554 Nos T-8 fittings with 20W LED fittings	11,080	121,880	355,114	35
	Total	**11,080**	**121,880**	**355,114**	**35**