

# ENERGY AUDIT REPORT | 2020

# ENERGY AUDIT REPORT 2020

## CONSULTATION REPORT

### Adichunchanagiri University



**Submitted to:**  
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## **ACKNOWLEDGEMENT**

**GREEN AURA, Bengaluru, Karnataka** takes this opportunity to appreciate & thank the management of **Adichunchanagiri University** for giving us an opportunity to conduct Energy Audit for the University.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

### **Energy Audit Team**

The study team constituted of the following senior technical executives from **Green Aura**:

- ✚ **Mr. Nischay N Gowda**, [Director, IGBC-AP, LEED-Green Associate]
- ✚ **Mr. Rajesh Kumar Singadiya**, [Accredited Energy Auditor, AEA-0284, Certified Energy Auditor CEA-7271 BEE, Ministry of Power, Govt. of India]
- ✚ **Mr. Sachin Kumawat** [ Project Engineer]

**Nischay N Gowda,**  
Director



## **EXECUTIVE SUMMARY**

The executive summary of the energy audit report furnished in this section briefly gives the identified energy conservation measures in the university.

### **AREAS FOR IMPROVEMENT**

#### **✚ POWER FACTOR IMPROVEMENT:**

- It was observed that the power factor of university is 0.84 of year-2020. It should maintain Unity by the capacitor health check-up on regular basis.

#### **✚ LIGHTING SYSTEM:**

- ✚ Replacement of “conventional T-12 (40 Watt)” tube light by Energy Efficient LED lighting fixture T-5 (18Watt or 20 Watt) in all Buildings, have great potential for Energy saving. Expected Energy saving is the subject of load factor and total annual operating hours.
- ✚ Installation of “Timer control on Straight light and Focus light on Building” recommended for Energy saving in the campus.
- ✚ Installation of Motion sensor in Non-Working Area (Wash room, Electrical Room. etc.) recommended for Energy saving in the campus.
- ✚ Installation of “Solar Alone System” on Street lighting, campus Lighting and Building focus lighting are have good potential for energy saving as well as sustainable development and conservation of natural resources.

#### **✚ CEILING FAN:**

- Replacement of “conventional Ceiling fan (60 Watt)” by Energy Efficient Star rated Fan or BLDC based Energy Efficient Fan (28Watt) in all Buildings, have great potential for Energy saving. Expected Energy saving is the subject of load factor and total annual operating hours.



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### Chapter-01 INTRODUCTION





#### 1.1 About University: -

The University is situated in a Lush Green Unitary Campus of 67 acres at B.G. Nagara, Nagamangala Tq., Mandya District, Karnataka on the Bangalore – Mangalore National Highway No. 75, 105 Kms from Bangalore, the Capital City of Karnataka.

The University consists of six Constituent colleges in the disciplines of Medicine, Pharmacy, Nursing, Engineering, Management, Commerce and Education. The environment-friendly campus has adequate infrastructure and physical facilities for Academics and Research. The campus possesses around 5000 students, 400 teachers and 1800 support staff.

The University employs a broad range of strategies to achieve its Vision, Mission and Objectives to expand the horizon of World Knowledge, provide instruction, Teaching-Learning, Training, Research and Development at the level of Higher Education in the faculties of Health Sciences, Engineering and Technology, Management and Technology, Humanities & Social Sciences and other Emerging and Thrust areas.

Following building bills and data are considering in this report Part-01

-  BGS Institute of Technology
-  BGS College of Education
-  BGS first grade college.
-  Adichunchanagiri School of Natural Science



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### VISION

Education for all with Value Systems of Empathy, Enrichment, Equity, Excellence, Empowerment, Entrepreneurship & Enlightenment to Serve the Society

### MISSION

- Education to all for Self Reliance, Socio-Economic Change to develop an Inclusive Society with Shared Opportunities & Responsibilities
- Empathy towards the Less Fortunate, the Sick, the Suffering & the Disabled
- Enrichment to acquire Abundant Knowledge, Requisite Skills & Appropriate Attitude
- Excellence for Quality Assurance, Enhancement & Sustenance in Academics & Research to produce Graduates of Global Standards
- Equity for Fairness & Social Justice by providing Equal Opportunities
- Empowerment of Graduates to become Intuitive, Innovative & Inventive
- Entrepreneurship is a concept or idea involving the product or service to be delivered, or a new technology to be developed
- Enlightenment to attain Wisdom & Virtues in Life to think beyond Self



## Master plan of the university:-







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**Total area of the university**

<b>AIMS College Block</b>				
Sr. No	Building Name	Old Exiting Building Up Area (sqm)	New building Build up Area (sqm)	Total Building Build Up Area in (sqm)
1	AIMS College	12,505.20	11801	24,306.20
2	AIMS Library block	2750	4799	7,549
3	Auditorium Block	2882.62	0	2,882.62
4	AIIMS Forensic block	1103	2151	3,254
5	Animal house	372.67	0	372.67
6	AIMS Teaching block	6569.66	0	6,569.66
<b>Total AIMS college Buildup area</b>				<b>44,934.15</b>

<b>Hospital block</b>				
Sl. No	Building Name	Old Exiting Building Up Area (sqm)	New building Build up Area (sqm)	Total Building Build Up Area in (sqm)
1	Hospita Block	3436.77	20343	57,779.77
2	Ward Block	0	16820	16,820
3	Casualty block	0	5792	5,792
4	OBG BLOck	0	1400	1,400
5	OT Block	0	3542	3,542
6	ICU Block	0	1987	1,987
7	OPD 2nd Floor	0	3018	3,018
8	OPD 2nd Floor	0	1138	1,138
9	Medical gas generator	0	374	380
10	OT block to ward block	0	604	604
11	ICU block to ward block	0	806	307
<b>Total Build up Area</b>				<b>92,767.77</b>



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<b>Residential Block</b>				
<b>Sl. No</b>	<b>Building Name</b>	<b>Old Exiting Building Up Area (sqm)</b>	<b>New building Build up Area (sqm)</b>	<b>Total Building Build Up Area in (sqm)</b>
1	AIMS Boys hostel	5480.92	10981	16,461.92
2	AIMS Girls hostel	12246.47	0	12,246.47
3	K B Boys PG Hostel	4361.05	0	4,361.05
4	K B Girls PG Hostel	3647.58	0	3,647.58
5	AIMS Staff quarter	12601.76	0	12,601.76
6	Nursing staff quarter	0	6977	6,977
7	Principle quarter	1253.53	0	1,253.53
8	Vijnatha bhawan	1894.28	0	1,894.28
9	Manasa complex	2328.62	0	2,328.62
10	Bank building	507.99	0	507.99
11	Working women HO	3801.11	0	3,801.11
12	Hospital canteen	351.3	0	351.3
<b>Total hospital buildup area</b>				<b>66,432.61</b>
<b>Total area in sq mtr</b>				<b>2,04,134.53</b>



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### 1.2 About Energy Audit

Energy audit helps to understand more about the ways energy is used in any plant and helps in identifying areas where waste may occur and scope for improvement exists. ***The overall energy efficiency from generation to final consumer becomes 50%. Hence one unit saved in the end user is equivalent to two units generated in the power plant. (1 Unit / 0.5 Efficiency = 2Units)***

Energy audit is the most efficient way to identify the strength and weakness of energy management practices and to find a way to solve problem. Energy audit is one kind of professional approach towards a responsible way in utilizing economic, financial, and social and natural resources. Energy audits can “add value” to the management approaches being taken by the institute and is a way of identifying, evaluating the system.

The GREEN AURA, Bengaluru, Karnataka carried out the energy audit at the site to find loopholes in the energy consumption pattern for Adichunchanagiri University. A technical report has been prepared as per the need and the requirement of the project.

### 1.2 Objectives of Energy Auditing

The energy audit provides the vital information base for overall energy conservation program covering essentially energy utilization analysis and evaluation of energy conservation measures. It aims at:

- Identifying the quality and cost of various energy inputs.
- Assessing present pattern of energy consumption in different cost centers of operations.
- Relating energy inputs and production output.
- Identifying potential areas thermal and electrical energy economy.
- Highlighting wastages in major areas.
- Fixing of energy saving potential targets for individual cost centers.
- Implementation of measures for energy conservation & realization of savings.

### 1.3 Methodology:

Methodology adopted for achieving the desired objectives viz.: Assessment of the current operational status and energy savings include the following:



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- ✚ Discussions with the concerned officials for identification of major areas of focus and other related systems.
- ✚ Team of engineers visited the site and had discussions with the concerned officials / supervisors to collect data / information on the operations and load distribution within the plant and same for the overall premises. The data was analyzed to arrive at a base line energy consumption pattern.
- ✚ Measurements and monitoring with the help of appropriate instruments including continuous and / or time-lapse recording, as appropriate and visual observations were made to identify the energy usage pattern and losses in the system.
- ✚ Trend analysis of costs and consumptions.
- ✚ Capacity and efficiency test of major utility equipment's, wherever applicable.
- ✚ Estimation of various losses
- ✚ Computation and **in-depth analysis** of the collected data, including utilization of computerized analysis and other techniques as appropriate were done to draw inferences and to evolve suitable energy conservation plan/s for improvements/reduction in specific energy consumption.

## **Chapter – 02 Power Supply System**

### **2.1 Transformers**

The power supply for the university is from Grid with the help of 11 KV feeders under Different Tariff Category. Sectioned load of the university is 200 KVA. University has a single transformer with Capacity 250 KVA.



Figure :- 250 KVA Transformer Photographs



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### 2.2 DG Sets: -

The university has 03 Nos DG sets to supply Emergency power during the grid Power Failure. The Capacity of the DG sets is given below.

Sr. No	DG Location	Capacity of DG	Quantity
1	Main College	100	1
2	Boys Hostel	100	1
3	Girls Hostel	62.5	1

### Observation

- ✚ DG set is used only in case of power failure.
- ✚ There is requirement of energy and fuel meters to monitor total unit generation with respect to fuel consumption

### 2.3 :- UPS System

University has installed -09 Nos UPS system for Instrument, Lab and Other Equipment's during the power failure . Details are given in the table.

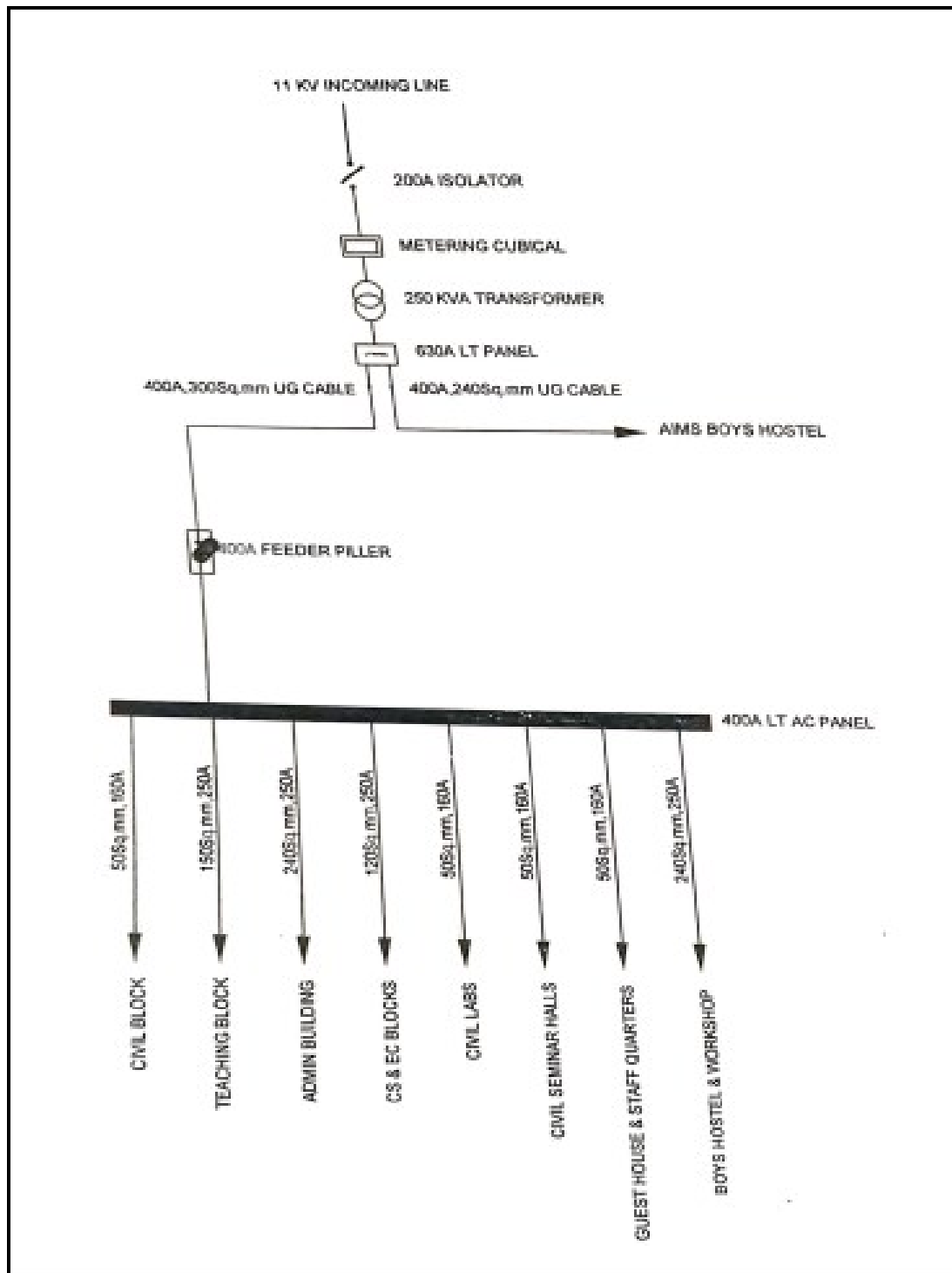
Sr. No	Department	Capacity (KVA)	Quantity
1	Office	20	1
2	BOT Lab	30	2
3	CSE	20	2
4	CSE	10	2
5	ISE	20	2
6	ECE	20	2
7	MECH	20	1
8	CIVIL	5	1
9	IS	60	2



### 2.4 Capacitor Bank

University has installed 120 kVAr capacitor bank to maintain Power factor to the feeder. Its Appreciable .

### 2.5 Single Line Diagram of University





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### 2.6 Solar system:-

University has installed 200 KWp solar system for renewable energy in the campus .

Details of unit generation in given in table

Sr. No	Month & Year	Unit Generation (KWp)	No of Days	Average CUF %
1	Jan-20	19260	31	12.9
2	Feb-20	19920	28	14.8
3	Mar-20	20213	31	13.6
4	Apr-20	19324	30	13.4
5	May-20	21342	31	14.3
6	Jun-20	19825	30	13.8
7	Jul-20	16140	31	10.8
8	Aug-20	14100	31	9.5
9	Sep-20	15060	30	10.5
10	Oct-20	15540	31	10.4
11	Nov-20	18960	30	13.2
12	Dec-20	18060	31	12.1
	Total	217744	365	12.5

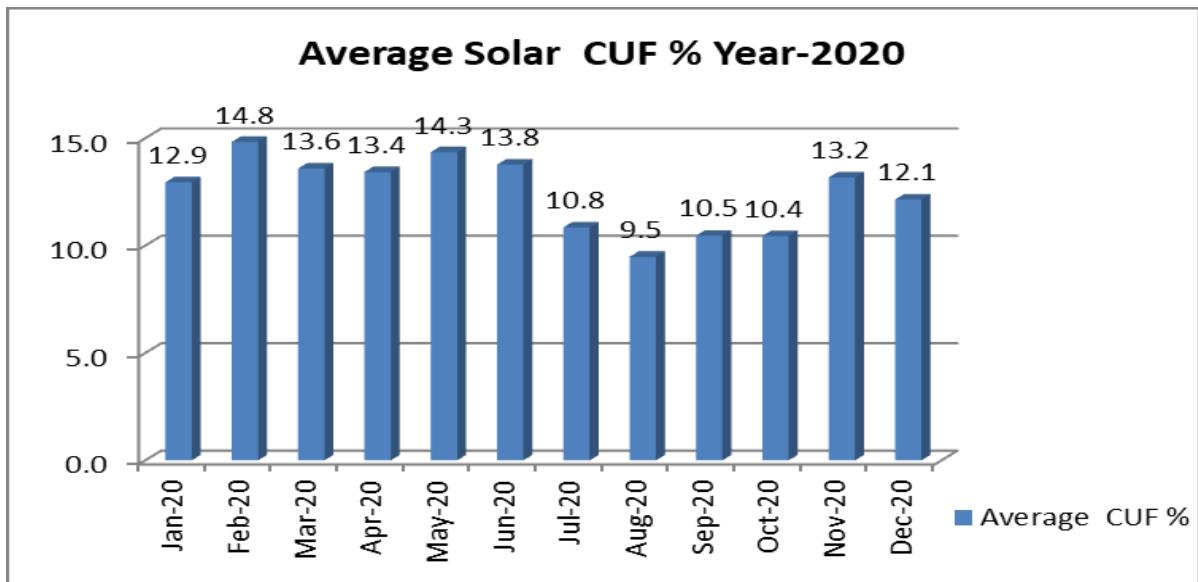


Figure :- Capacity Utilization factor of Solar system Year 2020

#### Observation :-

Total unit generation of Jan-2020 to Dec-2020 is 2,17,744 units. And average capacity utilization factor is 12.5 %. Which is lower It is recommended to cleaning of solar panel frequently to increase CUF.



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### Chapter-03 Energy Bill analysis

#### 3.1 Electricity Bill Analysis:-

Energy audit team was analysed Electricity bills of last one year. Details of unit consumption, annual average power factor and annual per unit charges are determined as follow:

Sr.No.	Month& Year	Unit consumption (kVAh)	Unit consumption (kWh)	Power Factor	Amount (Rs/-)	Rs/kVAh
1	Jan-20	43,560	39,980	0.92	3,34,880	7.69
2	Feb-20	43,400	41,280	0.95	3,45,382	7.96
3	Mar-20	38,670	32,770	0.85	2,78,937	7.21
4	Apr-20	23,630	14,110	0.60	1,40,289	5.94
5	May-20	23,630	15,480	0.66	1,49,736	6.34
6	Jun-20	25,900	29,850	0.76	1,84,417	7.12
7	Jul-20	26,880	20,500	0.76	1,89,286	7.04
8	Aug-20	26,800	21,410	0.80	1,96,230	7.32
9	Sep-20	28,070	22,760	0.81	2,06,673	7.36
10	Oct-20	29,734	24,362	0.82	2,06,598	6.95
11	Nov-20	31,400	25,720	0.82	2,19,800	7.00
12	Dec-20	42,090	38,650	0.92	3,36,338	7.99
		3,83,764	3,26,872	0.84	27,88,566	7.16

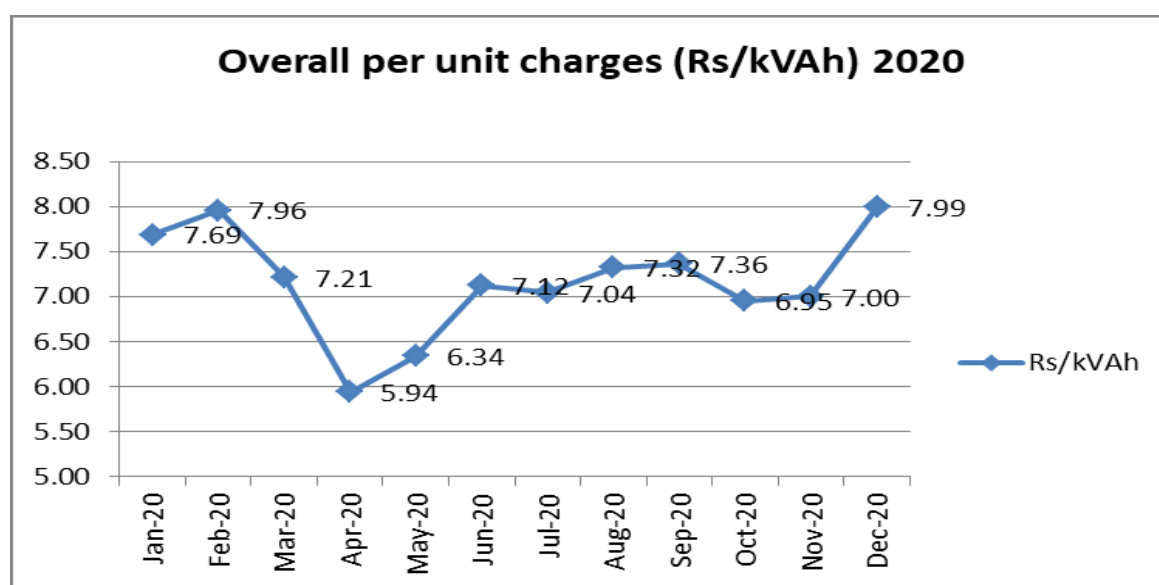


Figure :- Graphical Presentation of Overall per unit charges year-2020

#### Observation:

It was found that total energy consumption in the last 12 months was 3,83,764 units. The average annual energy charges are Rs 7.16 /kVAh unit.



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### 3.2 :- Average Power Factor of the university

Sr. No.	Month & Year	Power Factor
1	Jan-20	0.92
2	Feb-20	0.95
3	Mar-20	0.85
4	Apr-20	0.60
5	May-20	0.66
6	Jun-20	0.76
7	Jul-20	0.76
8	Aug-20	0.80
9	Sep-20	0.81
10	Oct-20	0.82
11	Nov-20	0.82
12	Dec-20	0.92
	Average	0.84

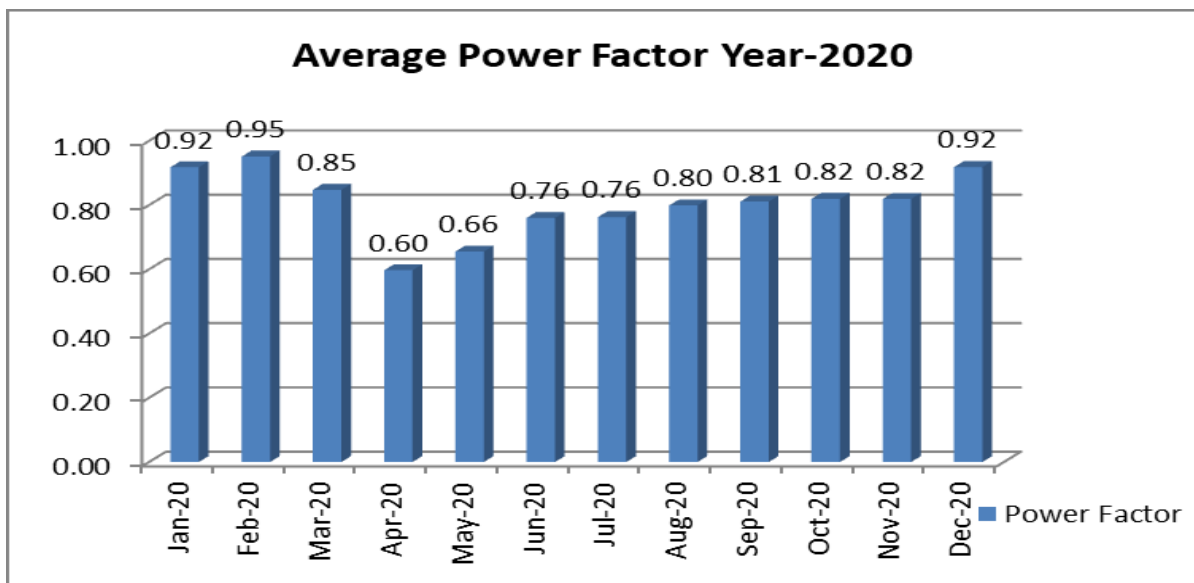


Figure :- Graphical presentation of average power factor of the university Year-2020

#### Observation:

- ✚ The average power factor was 0.84 for the year 2020. It is recommended to maintain power factor unity.



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**Chapter-04  
Connected Load System**

**4.1 HVAC system**

University has installed Package chillier , Split AC, Window AC for cooling system in university .Details are given in below.

Sr. No	Types of Equipment's	Quantity	Capacity	Unit
1	Chillers/ Window /Split	56	346	TR
2	Split AC	47	70.5	TR
3	Exhaust Blower	2	20	kW

**4.2 Electrical Motors in University.**

University has installed various type of motor for different application .Details are given in the table.

Sr .No	Department	Capacity (HP)	Capacity (KW)	Quantity (Nos)	Total kW
1	Mechanical Department	1	0.746	15	11.19
2		10	7.46	1	7.46
3		5	3.73	1	3.73
4		1	0.746	9	6.714
5		0.5	0.373	1	0.373
6	Water Supply	5	3.73	1	3.73
7		3	2.238	3	6.714
8		2	1.492	2	2.984
9	Boys Hostel	3	2.238	4	8.952
10		2	1.492	3	4.476
11		1	0.746	3	2.238
12	Heat Pump	6	4.476	2	8.952
13	Fire Hydrant	5	3.73	1	3.73
14	Garden Water Pump	5	3.73	1	3.73
Total KW in Motors				47	74.973



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**4.3 Lighting system of university:-**

University has installed different types of lighting system. Details are given in the table

Sr. No	Location	Rated Power (Watt)	Quantity	Total Power (kW)
1	Tube light	40	416	16.64
2	LED Light	20	9	0.18
3	LED Light	18	40	0.72
4	LED Light	9	11	0.099
Total Lighting load in kW				17.639





## **PART-02:- Adichunchanagiri Hospital & Research centre**

Following building bills and data are considered in this part-02

- ✚ Adichunchanagiri Institute of medical Science
- ✚ Adichunchanagiri College Hospital & Research Centre
- ✚ Adichunchanagiri College Nursing
- ✚ Adichunchanagiri College of Pharmacy

### **Chapter 2.2.1 Power Supply System**

#### **2.2.1 Transformers Adichunchanagiri Hospital & Research Centre**

The power supply for the Adichunchanagiri Hospital & Research Centre is from grid, with the help of 11 KV feeders under Different Tariff Category. Sectioned load of the university is 1250 kVA. University has 04 Nos transformer for Adichunchanagiri Hospital & Research Centre 02 Transformer is 1000 KVA and two other is 500 KVA.

#### **2.2.2 DG Sets Transformers Adichunchanagiri Hospital & Research Centre**

The university has 04 Nos DG sets to supply Emergency power during the grid Power Failure. The Capacity of the DG sets is given below.

Sr. No	Capacity of DG	Quantity
1	750	1
2	500	2
3	200	1

#### **Observation**

- ✚ DG set is used only in case of power failure.
- ✚ There is requirement of energy and fuel meters to monitor total unit generation with respect to fuel consumption



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### 2.2.3 :- UPS System

University has installed 750 KVA UPS system for Instrument, Lab and Other Equipment's during the power failure for emergency power supply . **Its appreciable**

### 2.2.4 Capacitor Bank

University has installed three no's of capacitor bank to maintain Power factor to the feeder. Its Appreciable. Details are given in below.

✚ 350 kVAr = 02

✚ 250 kVAr =01

### 2.2.5 Solar system Adichunchanagiri Hospital & Research Centre

University has installed solar system for renewable energy in the campus.

Details of unit generation in given in table

Sr. No	Month & Year	Solar Energy Generated (kWh)
1	Jan-21	46,450
2	Feb-21	42,211
3	Mar-21	50,214
4	Apr-21	51,536
5	May-21	46,826
6	Jun-21	34,385
7	Jul-21	28,544
8	Aug-21	36,965
9	Sep-21	38,838
10	Oct-21	30,098
11	Nov-21	34,842
12	Dec-21	36,325
	Total	4,77,234

Observation :-

Total solar unit generation is 4,77,234 unit in year-2020.



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**Chapter-03  
Energy Bill analysis**

**3.3.1 Electricity Bill Analysis Adichunchanagiri Hospital & Research:-**

Energy audit team was analysed Electricity bills of last one year. Details of unit consumption, annual average power factor and annual per unit charges are determined as follow:

Sr. No	Month & Year	Energy Consumption (kWh)
1	Jan-21	1,23,875
2	Feb-21	1,24,500
3	Mar-21	1,25,350
4	Apr-21	96,175
5	May-21	1,20,625
6	Jun-21	1,30,650
7	Jul-21	1,27,725
8	Aug-21	1,33,900
9	Sep-21	1,40,425
10	Oct-21	1,41,575
11	Nov-21	1,35,250
12	Dec-21	1,35,625
	Total	15,35,675

**Observation :-** Total Unit consumption 15,35,675 Units of year-2020



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**Chapter-04  
Connected Load System**

**4.2.1 HVAC system**

University has installed following HVAC equipment's system for Hospital and research centre. Details are given in table .

Sr. No	Types of Equipment's	Quantity	Capacity	Unit
1	AHU	17	285.6	HP
2	FCUs Unit	47	800	HP
3	Packaged Acs	2	26.4	HP
4	Split Ac	50	120	HP
5	Exhaust Blower	55	275	HP
6	Fresh Air Blower	10	50	HP
7	Bore well	6	30	HP
	Total HVAC Load in HP		1597	







