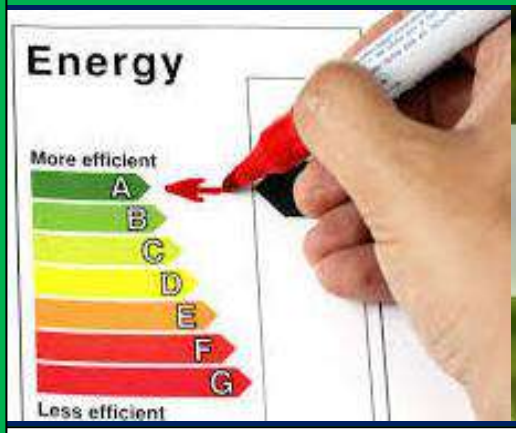
Energy Audit, Environmental Audit & Green Audit of Govt. V.Y.T. PG Autonomous College Durg



Conducted & Prepared By :-

RAJ ENERGY SERVICES,

……dedicated in energy conservation

62 & 81, DAYA NAGAR RISALI, BHILAI NAGAR, DIST. DURG, (C.G.)

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An ESCO Empanelled in Bureau of Energy Efficiency, New Delhi

1. INDEX

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3. ACKNOWLEDGEMENTS

We express our sincere thanks to Dr. R. N. Singh, Principal, Govt. Vishwanath Yadav Tamaskar Post Graduate Autonomous College, Durg for his kind support and giving us the assignment to contribute in their effort towards Green initiatives & efficient energy management in the college.

We are highly indebted to Dr. Jagjit Kour Saluja , IQAC Coordinator for their guidance, intellectual advice and his kind support in completing the project.

Our boundless gratitude to other teaching and non-teaching staff associated with this Energy Audit, Environment Audit & Green Audit study of Govt. Vishwanath Yadav Tamaskar Post Graduate Autonomous College, Durg for extending cooperation during collection of data and field study work.

We trust that the findings of this study will help the college in improving their Green initiative towards creating awareness for healthy and sustainable environment.

Raj Energy Services, Bhilai

Sanjay Kumar Mishra

Certified Energy Auditor, EA- 8696

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Exceptions

Nothing in this disclaimer notice excludes or limits any warranty implied by law for death, fraud, personal injury through negligence, or anything else which it would not be lawful for to exclude.

We trust the data provided by the Govt. VYT PG Autonomous College, Durg , personnel is true to their best of knowledge.

5. CERTIFICATE

RAJ ENERGY SERVICES

dedicated in energy Conservation

62 &81, Daya Nagar, Risali, Bhilai Nagar, 490006 (C.G.)
Mob.:9826179697 Email :resbhilai@gmail.com

ENERGY AUDIT, ENVIRONMENTAL AUDIT & GREEN AUDIT CERTIFICATE

This is to certify that M/s. Raj Energy Services has conducted Energy Audit, Environmental Audit & Green Audit of Govt. Vishwanath Yadav Tamaskar Post Graduate Autonomous College, Durg and submitted report under their Policy For Green Campus of the Institute.

Name of the Educational Institute	Govt. Vishwanath Yadav Tamaskar Post Graduate Autonomous College, Durg Near Raipur Naka, G.E. Road, Durg, [C.G.]
Contact Details	(0788) 2359688 E – Mail : pprinci2010@gmail.com Website :www. govtsciencecollegedurg.ac.in
Name of Principal	Dr. R.N..Singh
Details of facilities Audited	Office, All departments, Laboratories, Classrooms, seminar halls, Library, Hostel, Electrical Systems and complete Installations including Solar Power Plant, Rain Water Harvesting System Etc.
Date of Audit Conducted	27th, 28th ,29th & 30th December 2021
Name of Certified Energy Auditor	Sanjay Kumar Mishra
Registration Number	EA- 8696

For, Raj Energy Services

Date : January 1, 2022

(Sanjay Kumar Mishra)

Certified Energy Auditor from Bureau of Energy Efficiency, Ministry of Power, Government of India, New Delhi
EA- 8696

6. AUDITOR'S CERTIFICATE

BUREAU OF ENERGY EFFICIENCY

Examination Registration No. : EA-8696 Serial Number 5435

Certificate Registration No. : 5435

Certificate For Certified Energy Manager

This is to certify that Mr./Mrs./Ms. Sanjay Kumar Mishra Son/Daughter of Mr./Mrs. R. B. Mishra who has passed the National Examination for certification of energy manager held in the month of May 2008 is qualified as certified energy manager subject to the provisions of Bureau of Energy Efficiency (Certification Procedures for Energy Managers) Regulations, 2010.

This certificate shall be valid for five years with effect from the date of award of this certificate and shall be renewable subject to attending the prescribed refresher training course once in every five years.

His /Her name has been entered in the Register of certified energy manager at Serial Number 5435 being maintained by the Bureau of Energy Efficiency under the aforesaid regulations.

Mr./Mrs./Ms. Sanjay Kumar Mishra is deemed to have qualified for appointment or designation as energy manager under clause (/) of Section 14 of the Energy Conservation Act, 2001 (Act No.52 of 2001).

Given under the seal of the Bureau of Energy Efficiency, this 7th day of February, 2013

Digitally Signed: RAKESH KUMAR RAI
Sun Mar 01 10:31:41 IST 2020
Secretary, BEE New Delhi

Secretary
Bureau of Energy Efficiency
New Delhi

Dates of attending the refresher course	Secretary's Signature	Dates of attending the refresher course	Secretary's Signature
22.01.2019			

7 INTRODUCTION

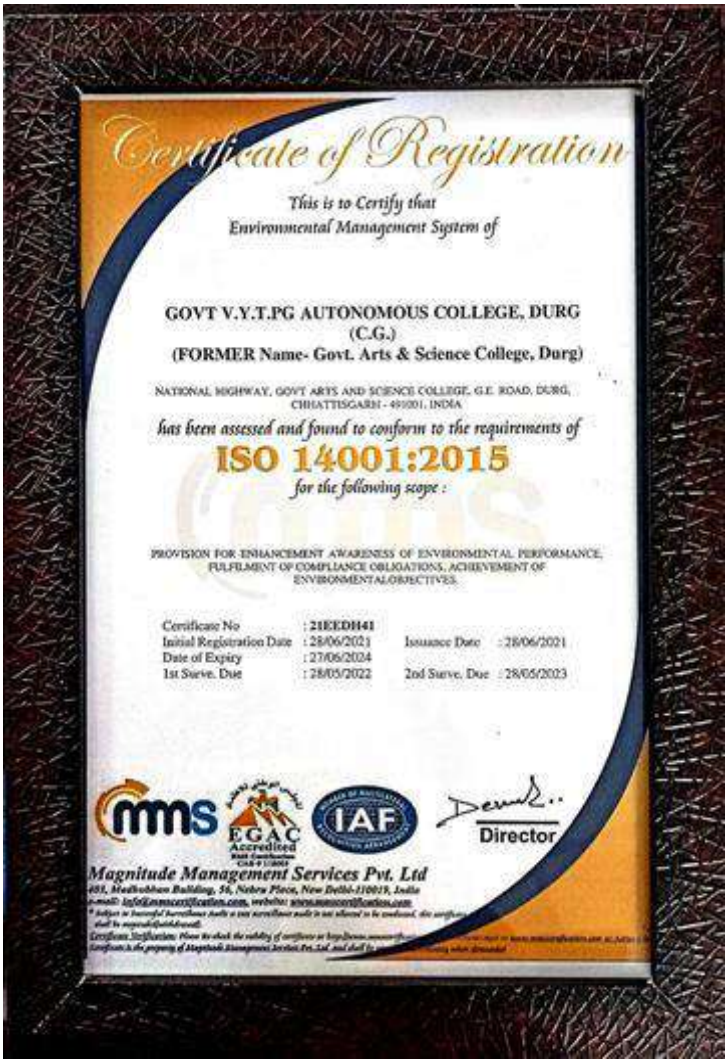
Government Vishwanath Yadav Tamaskar Post-Graduate Autonomous College, Durg, Chhattisgarh, India is a leading higher education institution in Chhattisgarh. It is affiliated to Hemchand Yadav University, Durg. The college has been conferred with the status of autonomy by UGC in 1989. The college was accredited with a grade 'A+' by NAAC in the Third cycle and has been recognized by UGC as 'College with Potential for Excellence (CPE), receiving the grant under III Phase of the scheme.

1.	Name of Institution	Govt. V.Y.T. PG Autonomous College, Durg (C.G.) -491001
2.	Address of the Institution	G. E. Road, Durg, (C.G.) (Opposite to B.I.T. Durg) 491001
3.	University Affiliated to	Hemchand Yadav University, Durg
6.	Name of the Principal	Dr. R.N. Singh
7.	Contact Number	9300119083
8.	E Mail ID	pprinci2010@gmail.com

Table 3 : Details of Institution

Five departments from the faculty of Science and one from Social Science have been identified by UGC under CPE scheme as highly rated departments. The institute has been shortlisted and recognized under DBT Star College Scheme by the Department of Biotechnology (DBT) Govt. of India. Under this scheme, 6 departments from the faculty of Science have been selected for providing financial support. The Department of Chemistry was recognized under the Funds for improving Science and Technology Infrastructure (FIST) Scheme by the Department of Science and Technology, Govt. of India.

Science & Library Science	Arts, Social Science, & Commerce	Research
Both UG and PG Programmes		
Physics	Hindi	Physics
Chemistry	English	Chemistry
Mathematics	Economics	Mathematics
Botany	Geography	Botany
Zoology	Political Science	Zoology
Geology	Sociology	Geology
Microbiology	History	Microbiology
Biotechnology	Commerce	Biotechnology
Library and Information Science		Hindi
Only UG Programmes		English
Anthropology	Sanskrit	Economics
Computer Science	Psychology	Geography
		Political Science
		Sociology
		History
		Commerce



Certificate of Registration

This is to Certify that
Environmental Management System of

GOVT V.Y.T.PG AUTONOMOUS COLLEGE, DURG
(C.G.)
(FORMER Name- Govt. Arts & Science College, Durg)

NATIONAL HIGHWAY, GOVT ARTS AND SCIENCE COLLEGE, G.E. ROAD, DURG, CHHATTISGARH - 491001, INDIA

has been assessed and found to conform to the requirements of
ISO 14001:2015
for the following scope :

PROVISION FOR ENHANCEMENT AWARENESS OF ENVIRONMENTAL PERFORMANCE, FULFILMENT OF COMPLIANCE OBLIGATIONS, ACHIEVEMENT OF ENVIRONMENTAL OBJECTIVES.

Certificate No	: 21EEDH41		
Initial Registration Date	: 28/06/2021	Issuance Date	: 28/06/2021
Date of Expiry	: 27/06/2024		
1st Surve. Due	: 28/05/2022	2nd Surve. Due	: 28/05/2023

Director

Magnitude Management Services Pvt. Ltd

The college had a humble start with just two rooms and 12 students that housed Arts and Science faculty, at the local *Hindi Bhawan*. The foundation stone of the present building was laid by the then Chief Minister of Madhya Pradesh Dr. Kailash Nath Katju in November 1958. It was shifted to its present site, a campus of 21.75 acres, in 1962. Since then the college has been continuously growing in terms of infrastructure and learning resources in its journey towards excellence.

Presently the college is one of the biggest Govt. Colleges in Chhattisgarh, a Lead College* of Durg district that provides administrative and academic support and guidance to 83 (19 Govt. & 64 Private Colleges) colleges of the district. The college has a student strength of 7410 in the current session. It holds the unique opportunity of being a mixed bowl of urban, tribal, and rural students, the majority of them being first-generation learners. The college, since its commencement, is serving society in a significant way by providing higher education to first-generation learners, making this a distinctive feature of this institution.

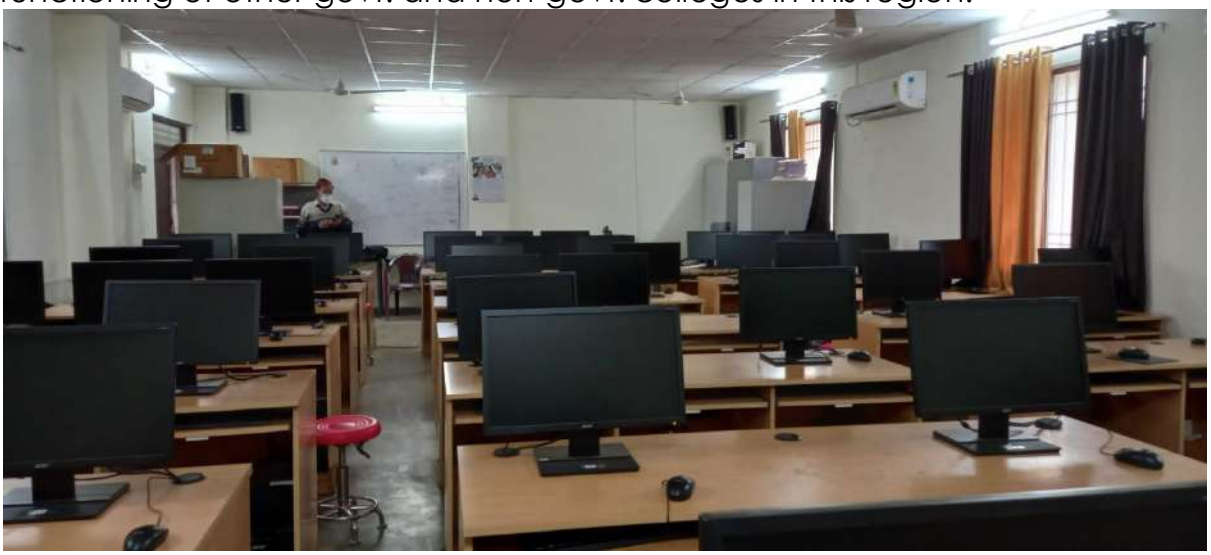
The institution always cherished its location advantage for being situated close to Durg Railway Junction and Bus Stand, alongside main road connecting state highways.

Govt. VYT PG Autonomous College has installed a Solar Power Plant of 10 KW capacity and a solar power plant of 50 KW is in pipeline.

	2020-21	2019-20	2018-19	2017-18	2016-17
Number of students	7115	5746	5412	5079	4469
Teachers	117	112	109	109	109
Non- Teaching Staff	91	87	82	82	78
Total	7323	5945	5603	5270	4656
Number of Working days	176	182	216	232	233

Table 4 : Total numbers of students, teachers &non teaching since last 5 years

Paramarsh Scheme of UGC for mentoring of other Institute of this region. Awarded **Global awards 2021** as **Excellence in educational services** for Best Research Impact under the "College Awards" Category. The Department of Higher Education, Govt. of Chhattisgarh has identified this institution as Lead College of District Durg to mentor and monitor academic and administrative functioning of other govt. and non-govt. colleges in this region.



हेमचंद यादव विश्वविद्यालय, दुर्ग
(छ.ग.)

विश्वविद्यालय परिक्षेत्र के अंतर्गत आने वाले महाविद्यालयों में अपनाई जाने वाली "बेस्ट प्रेक्टिसेस" संबंधी ऑनलाईन प्रतियोगिता

जुलाई – 2020

Certificate of Merit

प्रमाणित किया जाता है कि हेमचंद यादव विश्वविद्यालय, दुर्ग (छ.ग.) द्वारा जुलाई 2020 में आयोजित विश्वविद्यालय परिक्षेत्र के अंतर्गत आने वाले महाविद्यालयों में अपनाई जाने वाली "बेस्ट प्रेक्टिसेस" संबंधी ऑनलाईन प्रतियोगिता में शासकीय विश्वनाथ यादव तामस्कर स्नातकोत्तर स्वशासी महाविद्यालय, दुर्ग ने द्वितीय स्थान प्राप्त किया।

विश्वविद्यालय परिवार शुभकामनाओं सहित शासकीय विश्वनाथ यादव तामस्कर स्नातकोत्तर स्वशासी महाविद्यालय, दुर्ग के उज्ज्वल भविष्य की कामना करता है।

डॉ. प्रशान्त श्रीवास्तव
अधिष्ठाता, छात्र कल्याण

डॉ. सी.एल. देवांगन
कुलसचिव

डॉ. अरूणा पल्टा
कुलपति

1. Total land (area in Acre)	21.75 Acre
2. Constructed area (in sq ft)	7.2 Acre
3. Total proposed area for development (in sq ft or in acre)	5.9 Acre
4. Total proposed area for greenery and environmental services including water harvesting and composting (in sq ft or in acre)	2.3 acre
5. Whether there is a Land use management plan available for the campus (Yes / No)	Yes

Table 5 : Area used in college

Keeping pace with the challenging need of the day the college has undergone major paradigm shift in terms of pedagogical methodology, from conventional ways of teaching to ICT enabled teaching. It has successively established smart classrooms, provided with Wi-Fi connectivity and computerized library to facilitate effective teaching and learning.

Library

The college library is fully automated with RFID facility and well equipped with books, journals, periodicals and reading rooms. The library has web-OPAC for providing remote access to its repositories of textual resources. Along with book bank facility for SC and ST students, library has specially designed furniture for divyang students and books in BRAILLE are also available for the visually challenged students.

Career Counselling and Placement Cell

Career Counselling and Placement Cell monitors activities related to job notifications and opportunities, Interview preparation, development of entrepreneurial skills, organizing of campus Interviews besides ensuring maximum participation in campus recruitments and interviews. The cell works in coordination with all Head of departments to cater to diverse need of students. It is actively engaged in organizing Inspirational lectures by experts.

It aims at guiding students towards cracking Civil Service exams. The Cell also attempts at encouraging students by providing them opportunities to interact with young probation officers, senior civil servants, Defense Officers etc. who have already cracked the exams.

The college is moving forward with a multi-pronged strategy towards excellence with a view to come out as an institution of the future that prepares the students equipped with knowledge, skill, aptitude and social commitment.

General issues:

➢ **Awareness of Environmental policy**	Yes
➢ **Environmental protection rules**	• Ban on single use plastic • Proper disposal of discarded and unsafe materials of laboratories • Periodic use of bicycles • Controlled use of water
➢ **Housekeeping schedule**	• Regular dusting and mopping in class rooms, veranda and laboratory areas
➢ **Activities done for environmental cleanliness**	• Plantation • Awareness campaigns
➢ **Celebration of Important days**	• World Environment Day, Earth Day, Ozone Day, National Pollution prevention Day, Vishwa Shaochalya Diwas etc.
➢ **Participation in Local and National Environmental protection movements**	• Participation in Swachh Bharat Movement • Activities through NSS, YRC

Vision of College

To empower the youth, especially belonging to the underprivileged sections of society, through quality education by inculcating philanthropic values and enabling them to meet the challenges of the contemporary knowledge society.

Mission

To translate the vision into reality the institution is committed to -

- Embrace in its fold students from all sections and categories especially addressing to the needs of the first generation learners.
- Expose the students (especially the under-privileged ones) to variety of activities, academic and extra-academic, aiming at their overall development.
- Inculcate humanistic and social values in the students to motivate them towards community services.
- Kindle the entrepreneurial spirit in students.
- Inspire the young minds to develop the habits of critical thinking to achieve Creative Excellence.
- Promote quality research among the teachers and students.
- Sensitize the students on issues relating to ecology, environment, human rights and gender equality.
- Foster global competencies.

The Covid 19 brought in new challenges into the entire education system due to the sudden lockdown. Exams of the undergraduate classes and the teaching of the semester classes were suspended.

• The professors took the initiative of immediately opening the online teaching classes for the students. Video lectures, reading materials in the form of pdfs, audio lectures were uploaded to the college website for the benefit of the students.

- The students were also supported with their assignments and courses through Calls, Whatsapp groups, and U-tube lectures.

- The department of English Took the initiative of holding the first International Webinar in the state to address the issues of Virtual Education on the topic Emerging Challenges in Teaching Literature and Language in the Virtual World. Attended by nearly 200 participants from 7 different countries, the participants and Invited Speakers shared the platform to brainstorm on the topic and looked into the challenges and the possible solutions.

- As a follow-up of the result of the webinar, the department then organized a 5 day FDP on Teaching Learning and Research.

- Other departments like, Chemistry, Zoology, Mathematics, Biotechnology too have been holding webinars on their subjects.

- The Department of Zoology has held 6 webinars.

- The Department of History has organized a webinar specially for students and research scholars in which the participants also presented their papers.

- The students of NSS, YRC and NCC have supported the community during the lockdown by making and distributing masks, distributing sanitizers, explaining Social distancing in the markets and other public places.

Energy Management

- Auditing for Energy Management of the Govt. VYTPG Auto. College for Environmental Consciousness and Sustainability.

- Alternate Energy initiatives such as: Percentage of annual power requirement of the Institution met by the renewable energy sources.

- Percentage of annual lighting power requirements met through LED bulbs (Current year data)

8. ENERGY MANAGEMENT

Energy Management is the strategy of adjusting and optimizing energy, using systems and procedures so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems"

Principle of Energy Management

- Procure energy at lowest possible price
- Manage energy use at highest energy efficiency
- Reusing and recycling energy
- Select low investment technology to meet present requirement and environment condition
- Make use of wastes generated within the plant as sources of energy and reducing the component of purchased fuels and bills

8.1 Energy Scenario

Electrical energy is supplied by Chhattisgarh State Power Distribution Company Limited. There are total six energy meter catering the electrical demand of Government VYT PG Autonomous College Durg. One of the LT connection meter is only for boys hostel and other five LT connections are catering the electrical demand of college premises.

An off- grid solar power plant having 10 KW capacity is commissioned as use of renewable energy.

This solar power plant is installed on 12th September,2018 by Electromech devices Manufacturing Co. P. Ltd. And solar modules are supplied by Tata Power.

The energy generated by solar power plant is recorded by an energy meter. The maintenance of solar power plant is done by Chhattisgarh State Renewable Energy Development Agency

Total Contract Demand in KW	238.605

8.2 Electricity Bill Analysis

We have analyzed the electricity bills of all the connections of college premises and Azad hostel.

Sl. No.	Name of Connections	Service Number	Contract Demand in Watt	Tariff Category
1	Science College, Principal VYTPG	1007771720	36000	LV2ND3OT19
2	Dr Siddhiki Azad Hostel	1007795059	47000	LV1DL1SG19
3	Library	1000664394	20000	LV2ND3SG19
4	Govt Arts & Science college	1002042325	48000	LV2ND3SG19
5	Science college	1000664205	41005	LV2ND3SG19
6	Zoology Lab	1004227549	46600	LV2ND3SG19
	Total		**238605**	

Table 6 : Details of all service number and Contract Demand.

Analysis of billings of meters of College premises

	S.C. No.	Contract Demand in KW	Maximum Demand in KW	Average Unit Per Month
2019-20	BP No. 1007771720	36	6	790
	BP No. 1002042325	48	24.57	1638
	BP No. 1000664205	41.005	39.68	5697
	BP No. 1004227549	46.6	17	1415
	BP No. 1000664394	20	10	1354
	Total	191.605	97.25	10894
	Total Average Annual Unit Consumption			1,30,728

Table 7 : Analysis of billings of meters of College premise for the year 2019-20

	S.C. No.	Contract Demand in KW	Maximum Demand in KW	Average Unit Per Month
2020-21	BP No. 1007771720	36	12.6	295
	BP No. 1002042325	48	16.4	701
	BP No. 1000664205	41.005	14.92	2498
	BP No. 1004227549	46.6	10	757
	BP No. 1000664394	20	10	736
	Total	191.605	63.92	4987
	Total Average Annual Unit Consumption			59,844

Table 8 :Analysis of billings of meters of College premise for the year 2020-21

Analysis of billings of Azad Hostel

Year	Contract Demand in KW	Maximum Demand in KW	Average Unit Per Month
2019-20	47	2.4	1137
2020-21	47	11.4	1655

Table 9: Analysis of billings of Azad Hostel for the year of 2019-20 & 2020-21

Graphical Representation of Service Consumer number, Contract Demand and maximum demand occurred in the year 2019-20 and 2020 - 2021

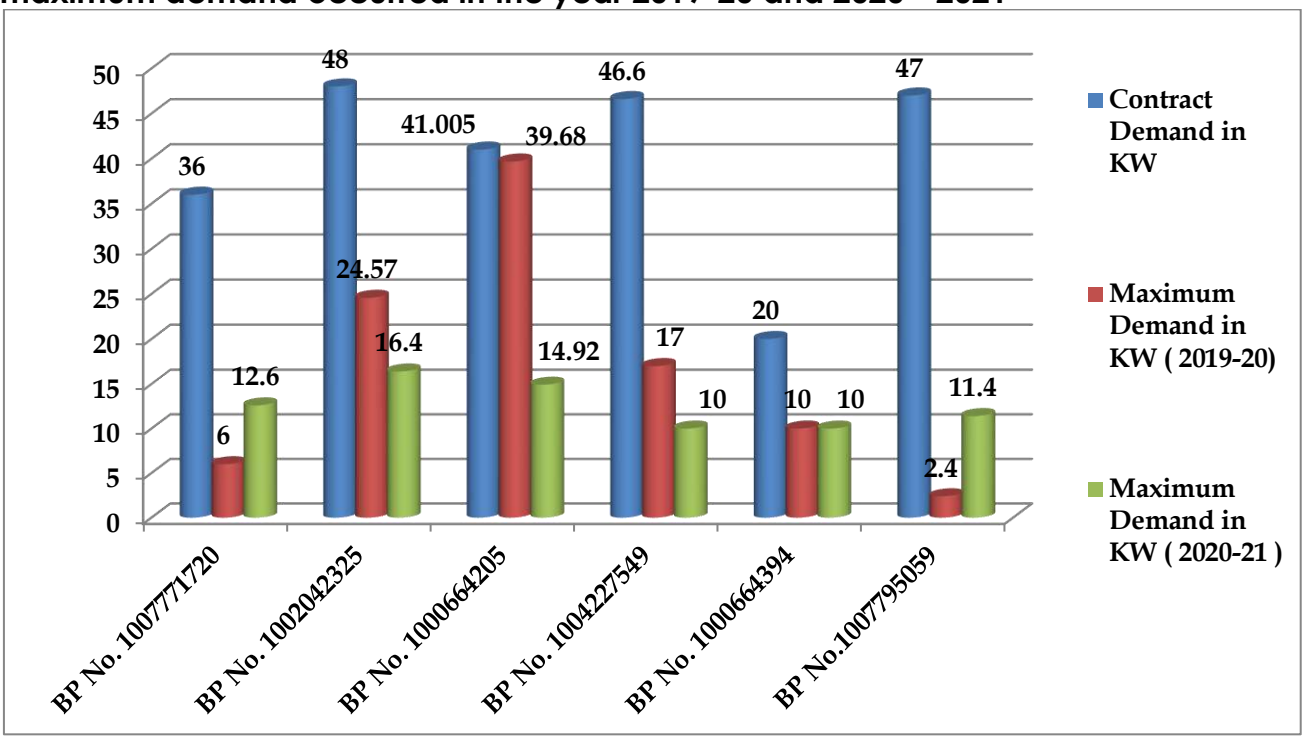


Figure 1: Graphical Representation of Service Consumer number, Contract Demand and maximum demand occurred in the year 2019-20 and 2020 - 2021

Graphical Representation of Service Consumer number with average unit consumption in the year 2019-20 & 2020 – 2021.

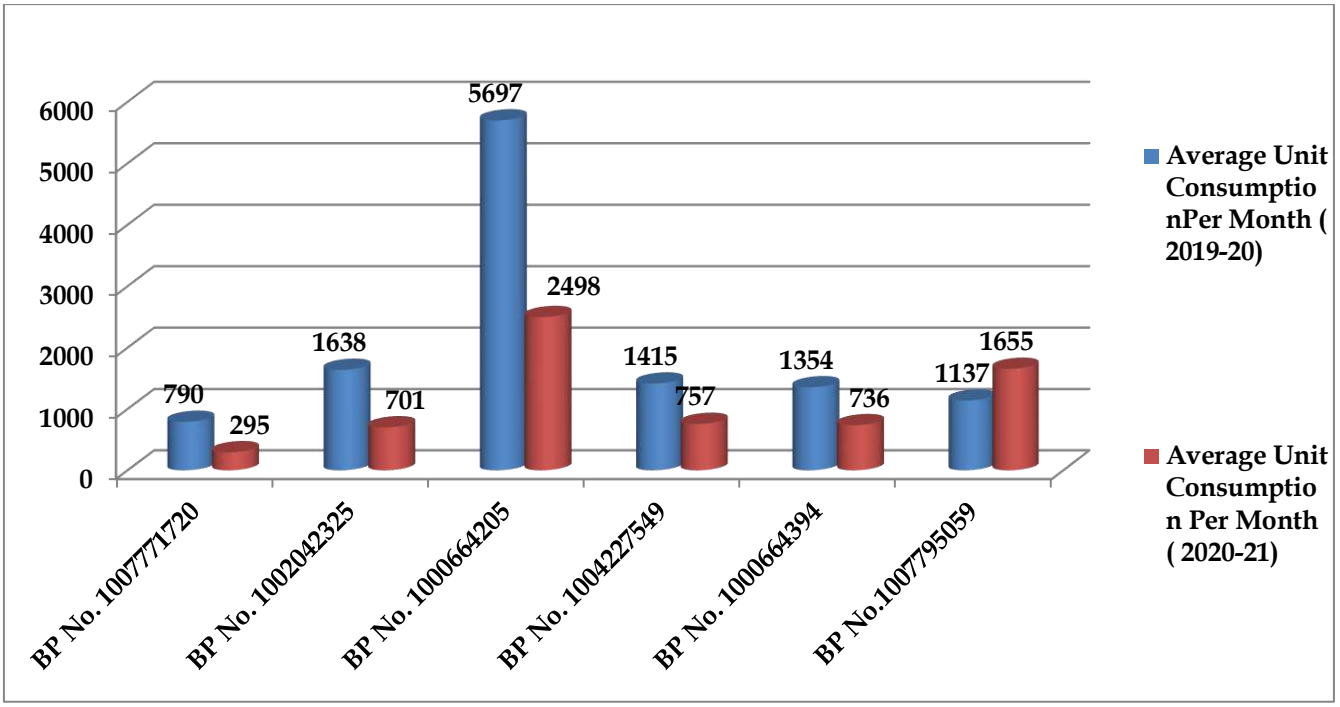


Figure 2: Graphical Representation of Service Consumer number with average unit consumption in the year 2019-20 & 2020 - 2021

8.3 Connected Load of College premises

Segment	Electrical Equipment	Wattage	Quantity	Total load in Watt
Lighting	LED TL	20	570	11400
		23	325	7475
	FTL TL	40	325	13000
		36	251	9036
	LED Street Light	36	17	612
		50	7	350
		200	3	600
	LED Bulb	9	66	594
		15	125	1875
		18	38	684
		23	17	391
	LED Panel Light	12	5	60
		15	10	150
	Total Lighting Load			46227
HVAC	Ceiling Fan	80	1340	107200
	Wall Fan	70	17	1190
	Cooler 18"	300	22	6600
	Symphony Small	150	7	1050
	Symphony Big	250	8	2000
	Exhaust Fan 12"	150	7	1050
	Exhaust Fan 14"	200	4	800
	Exhaust Fan 18"	250	39	9750
	Air Conditioner 1 T	5	1000	5000
	Air Conditioner 1.5 T	27	1600	43200
	Air Conditioner 2 T	3	2100	6300
	Total HVAC Load			184140
Office Equipment	Computer	100	318	31800
	Printer	55	22	1210
	Photo Copy Machine	600	16	9600
	Total Office Equipment Load			42610
Water Supply	Submersible pump	750	1	750
	pump 1	3750	1	3750
	pump 2	2250	1	2250
	Total Water Supply Load			6750
Others	Water Cooler Small	300	8	2400
	Water Cooler Big	600	2	1200
	Smart Board	150	8	1200
	Refrigerator Medium	500	15	7500
	Others			20000
	Total Other Connected Load			32300
Total Connected Load in Watt				**312027**
Total Connected Load in Kilo Watt (Say)				**312 KW**

Table 10: Connected load of college

8.4 Segment wise connected load and their percentages

Segment	Total load in Kilo Watt	Load in Percentage
Lighting	46.3	15
HVAC	184	59
Water Supply	6.75	2
Office Equipments	42.6	14
Others	32.3	10

Table 11 : Segment wise connected load and their percentages

Graphical Representation of Connected Load

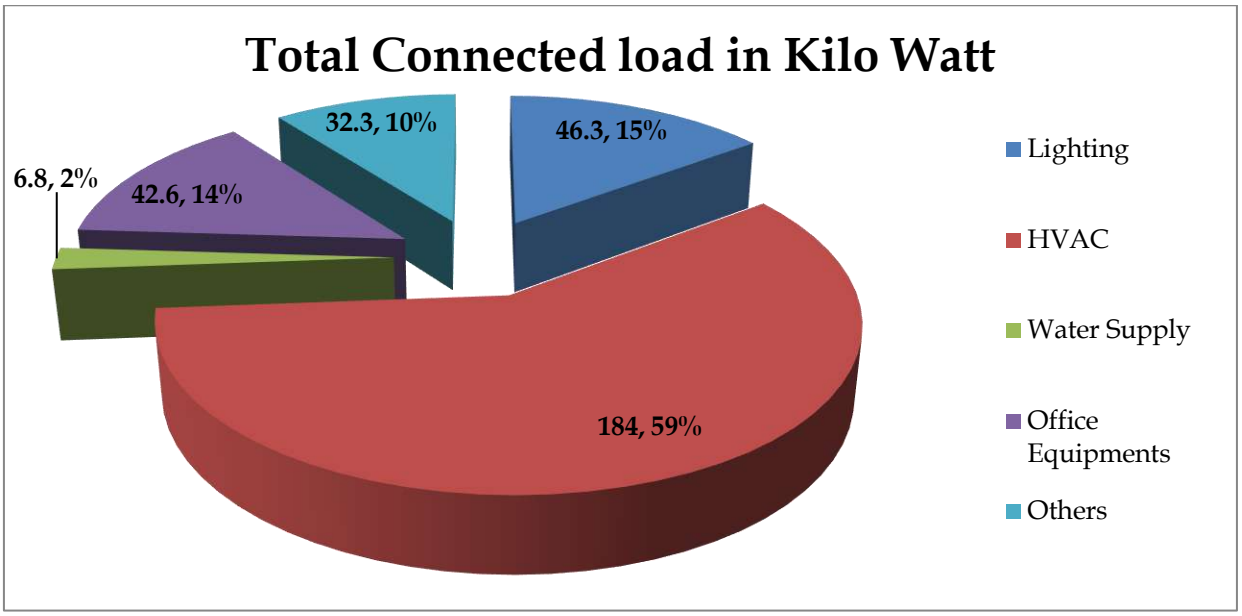


Figure 3 : Total Connected Load

8.5 Connected Load of Azad Hostel

Segment	Electrical Equipment	Wattage	Quantity	Total
Lighting	FTL 40 watt	40	95	3800
	LED TL 20 Watt	20	80	1600
	LED Bulb	9	12	108
	LED Bulb	15	19	285
	LED Bulb	23	7	161
	LED Street Light	36	4	144
	LED Street Light	50	2	100
	LED Street Light	100	1	100
	Total Lighting Load			6298
HVAC	Ceiling fan	70	90	6300
	Water Cooler	300	4	1200
	Water Cooler big	550	1	550
	Total HVAC Load			8050
Others	Others			1200
Total Connected Load in Watt				15548
Total Connected Load in Kilo Watt				16 KW

Table 12 : Connected load of Azad hostel

Total Connected Load in College

Connected Load of Govt. VYT PG Autonomous College	312 KW
Connected Load of Azad Hostel	16 KW
Total Connected Load of Govt. VYT PG Autonomous College including Azad Hostel	328 KW

Table 13: Total connected load in college

8.6 Total Annual Energy Consumption

Segment	Electrical Equipment	Wattage	Quantity	Hours	No. of Days	Diversity Factor	Annual Unit Consumption
Lighting	LED TL	20	570	6	210	0.4	5746
		23	325	6	210	0.4	3767
	FTL TL	40	325	6	210	0.4	6552
		36	251	6	210	0.4	4554
	LED Street Light	36	17	12	365	1	2681
		50	7	12	365	1	1533
		200	3	12	365	1	2628
	LED Bulb	9	66	4	50	1	119
		15	125	12	365	1	8213
		18	38	12	365	1	2996
		23	17	12	365	1	1713
	LED Panel Light	12	5	6	280	1	101
		15	10	6	210	1	189
HVAC	Ceiling Fan	70	1340	6	180	0.3	30391
	Wall Fan	70	17	6	180	0.5	643
	Cooler 18"	300	22	4	120	0.5	1584
	Symphony Small	150	7	4	120	0.5	252
	Symphony Big	250	8	4	120	0.5	480
	Exhaust Fan 12"	150	7	6	210	0.7	926
	Exhaust Fan 14"	200	4	6	210	0.7	706
	Exhaust Fan 18"	250	39	6	210	0.7	8600
	Air Conditioner 1 T	5	1000	5	110	0.5	1375
	Air Conditioner 1.5 T	27	1600	5	110	0.5	11880
	Air Conditioner 2 T	3	2100	5	110	0.5	1733
Office Equipment	Computer	70	318	6	210	0.1	2805
	Printer	55	22	3	210	0.1	76
	Photo Copy Machine	600	16	3	210	0.25	1512
Water Supply	Submersible pump	750	1	2	365	1	548
	pump 1	3750	1	1	310	1	1163
	pump 2	2250	1	1	310	1	698
Others	Water Cooler Small	300	8	7	210	1	3528
	Water Cooler Big	600	2	7	210	1	1764

	Smart Board	150	8	1	100	0.3	36
	Refrigerator Medium	400	15	12	210	1	15120
	Other Equipments						4116
	Total Annual Energy Consumption in KWH						130728

Table 14 : Annual unit Consumption

The connected load is comprised of class room & office lighting, Heating, ventilation and air conditioning , Street lighting and other connected load.

The details of annual unit consumption of Azad hostel is mentioned below :-

Azad Hostel

Segment	Electrical Equipment	Wattage	Quantity	Hours	No. of Days	Diversity Factor	Annual Unit Consumption
Lighting	FTL 40 watt	40	95	8	240	0.8	5837
	LED TL 20 Watt	20	80	8	240	0.8	2458
	LED Bulb	9	12	8	240	0.8	166
		15	19	8	240	0.8	438
		23	7	8	240	0.8	247
	LED Street Light	36	4	12	365	1	631
		50	2	12	365	1	438
		100	1	12	365	1	438
HVAC	Ceiling fan	70	90	12	240	0.8	14515
Others	Water Cooler	300	4	8	240	1	2304
	Water Cooler big	550	1	8	240	1	1056
Total Annual Energy Consumption in KWH							28528

Table 15: Annual Unit consumption of Azad hostel

8.7 Segment wise Annual Unit Consumption College Premises

Segment	Annual Unit Consumption
Lighting	40792
HVAC	58570
Office Equipment	4393
Water Supply	2409
Others	24564

Table 16 : Segment wise Annual Unit Consumption

8.8 Segment wise Annual Unit Consumption Azad Hostel

Segment	Annual Unit Consumption
Lighting	10653
HVAC	14515
Others	3360
Total	28528

Graphical Representation of Annual Unit Consumption in College Premises

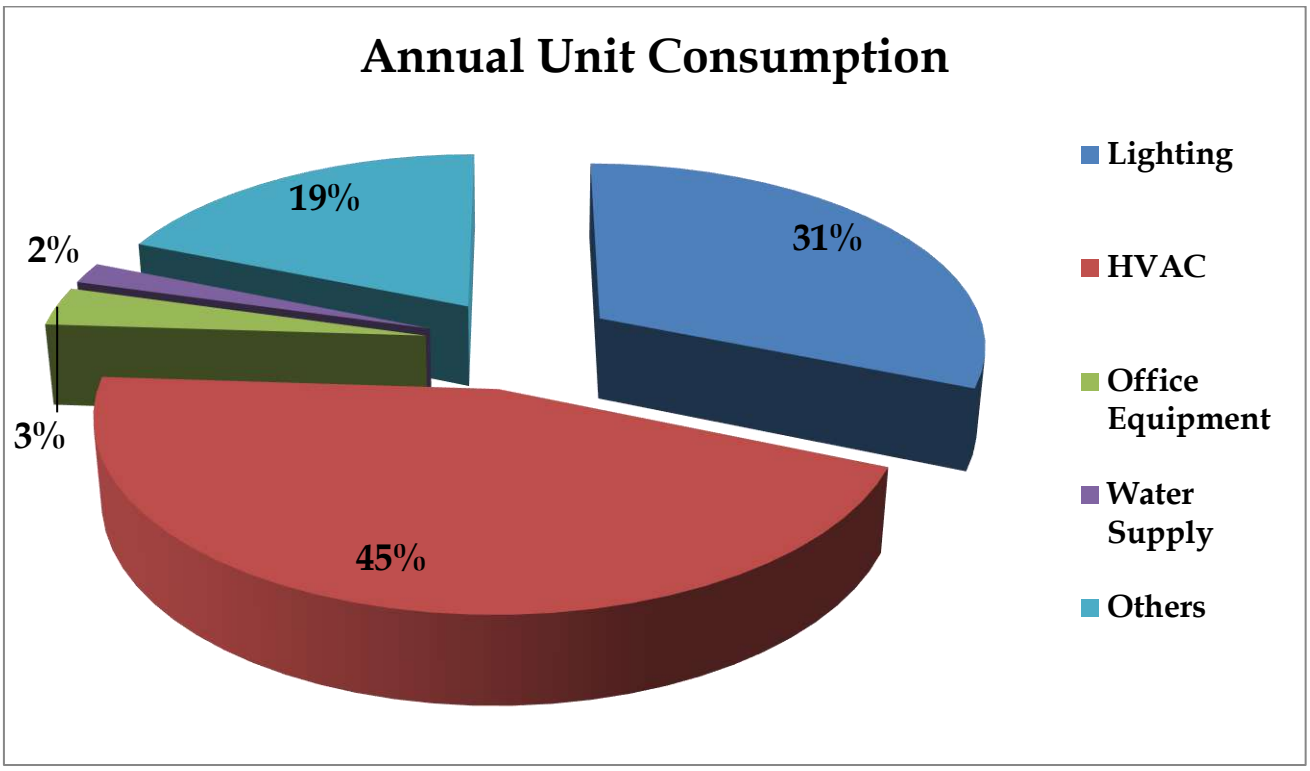


Figure 4 : Annual Unit Consumption

The maximum share of connected load is HVAC i.e. 45%

Total Electricity Consumption by College premises & Azad hostel	**159256**

8.9 Electricity Consumption from Solar Power Plant

An off-grid solar system permits electricity to be harnessed by solar panels and stored inside a battery without direct connection to the utility grid, providing an independent power supply to your home or business.

Basically, an off-grid solar system is a novel innovation which provides you independent energy harnessed by the sun. An off-grid solar system is made up of the following components.

- solar panels
- charge controllers
- battery bank(s)
- inverters

College has installed an off grid solar power plant of 10 KW Capacity.

The ingenuity of an off-grid solar energy system is made-up of the efficiency of its components. A solar energy system's solar panels, charge controllers, battery bank, and inverters all work together to provide your laptop or refrigerator energy, and this is how.

Off-grid solar energy systems work by…

1. **Solar Panels (PV array).** Solar panels are set either on your rooftop or in an open yard or property space. The Sunlight is soaked up by the solar panels and transferred to the charge controllers.

2. **Charge Controllers.** The charge controller is the "delivery man" between the solar panels, the inverters, and the battery bank. Charge controllers also act as a regulator, ensuring that the amount of power received through the solar panels does not overload the battery, instead keep the battery fully charged and top it off when needed. The charge controllers either deliver the energy directly as DC power to your lights or to the inverters to be converted into AC power for household appliances and all excess energy goes to the…

3. **Battery Bank.** With the charge controllers feeding energy to the batteries, the battery bank acts as the heart of the off-grid solar system, as it stores up excess energy for cloudy days and nights, when needed it pumps electricity to the…

4. **Inverters.** Lastly, inverters convert the DC (direct current) power into AC power which is passed on to be digested by college electrical appliances as DC power and allows student & staff of the college to switch on the light, fan or any other electrical equipment.

Schematic Diagram of Off- grid Solar Power Plant

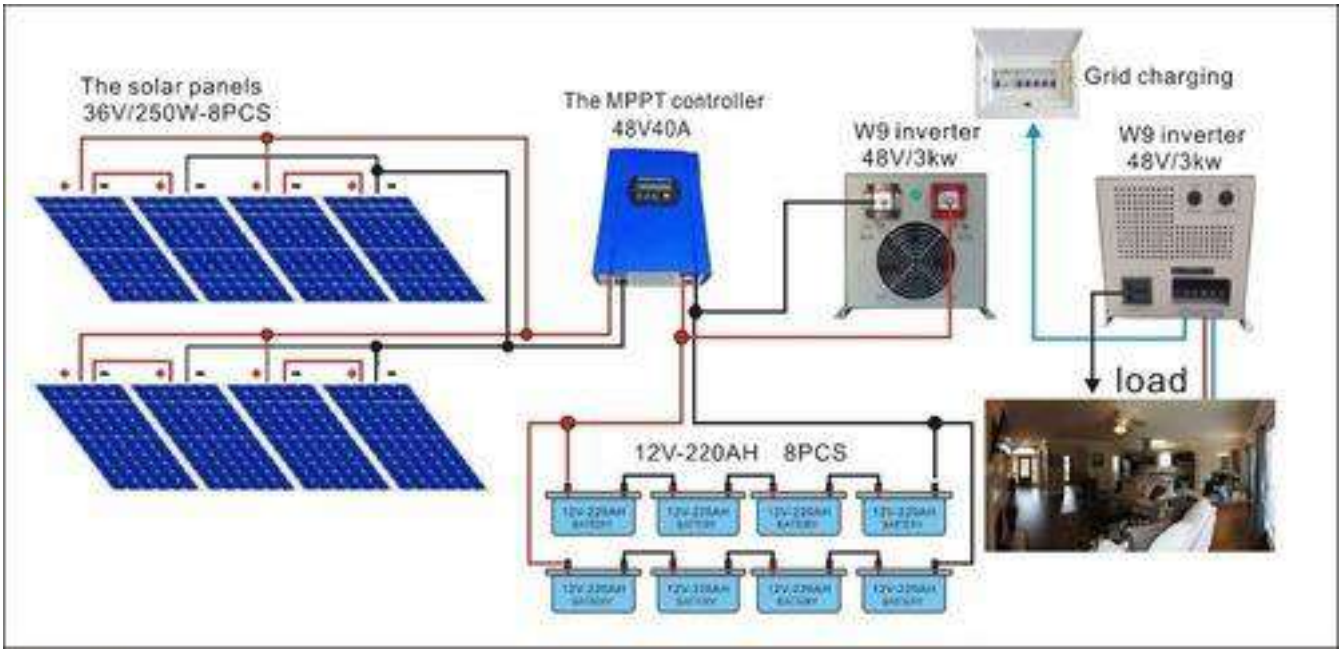
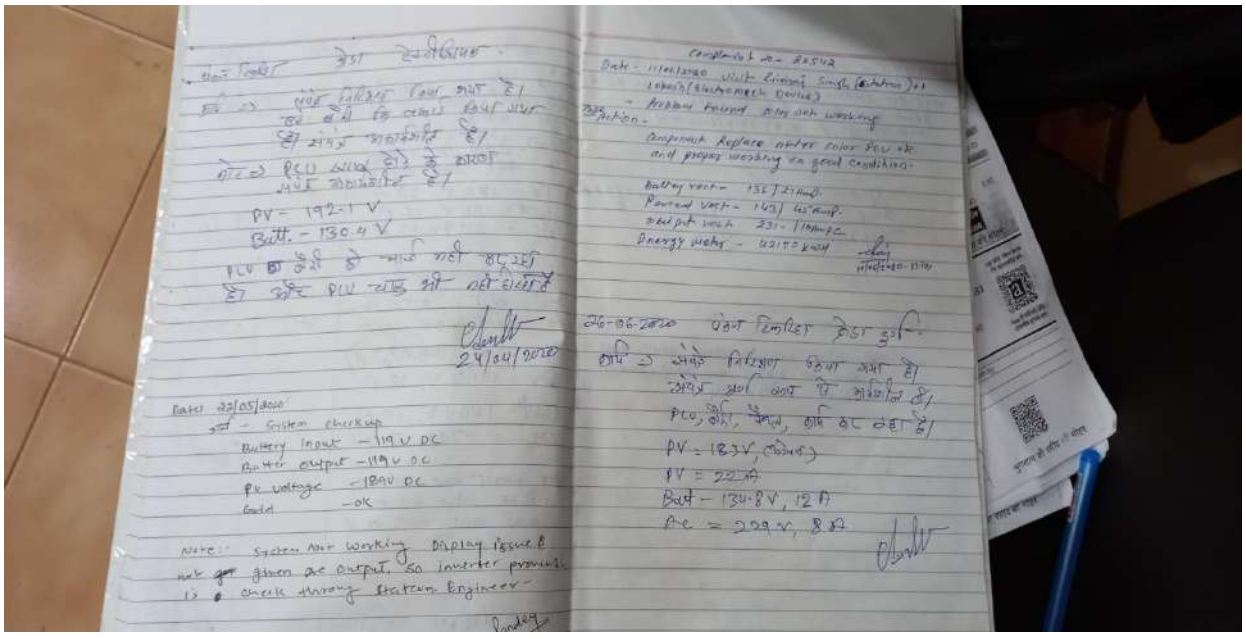


Figure 5: **Schematic Diagram of Off- grid Solar Power Plant**

The Solar power plant is maintained by CREDA, Durg. They take the record of Solar power generation and maintenance activity in a register.



The Solar Power plant was installed on 12th September 2018 and commissioned on 17th November 2018. Total 35 numbers of solar modules of Tata Solar make , each having 295 W capacity are installed. Rated voltage is 36.50 Volt.

Total 60 numbers of Hi Power make LAML battery of 600 AH, 2 V are connected. Technician of CREDA comes once in a three month for regular check up.

Consumed solar power is recorded in a meter. Old meter is replaced by new meter.

Unit Consumed from solar power in Three yeas

Unit recorded in old meter	3742
Unit recorded in old mete	9234
Total Electricity consumed	12976
Unit Consumed per year	4325

.10 Percentage of annual power requirement of the Institution met by the renewable energy sources.

Total Contract Demand in KW	239
Capacity of Solar Power Plant	10

Total Contract Demand in KW	239
Capacity of Solar Power Plant	10
Percentage of annual power requirement of the Institution met by the renewable energy sources.	4.2 %

Table 17: Percentage of annual power requirement of the Institution met by the renewable energy sources.

Graphical Representation of Percentage of annual power requirement of the Institution met by the renewable energy sources.

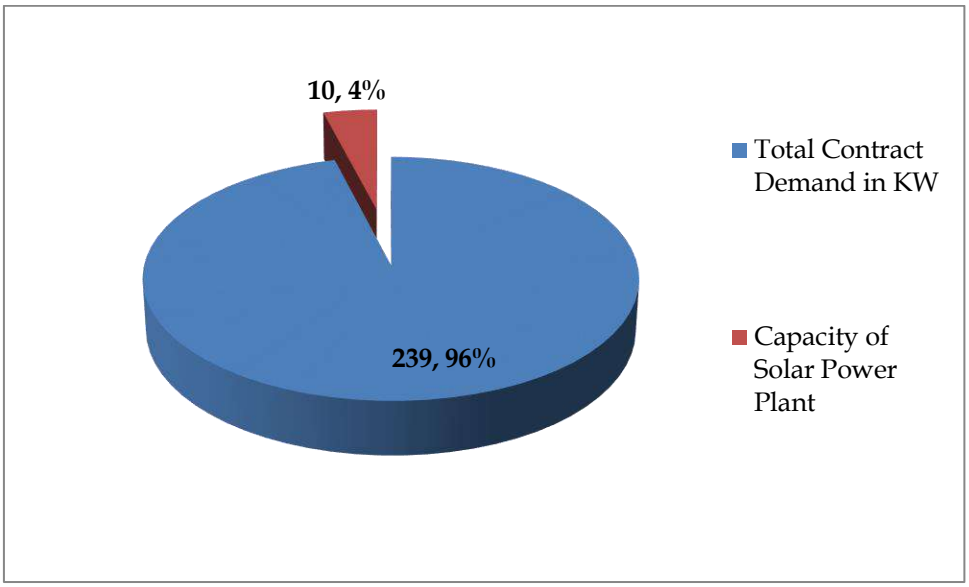


Figure 6: Graphical Representation of Percentage of annual power requirement of the Institution met by the renewable energy sources.

Thus, Solar power contributes 4 % of total power requirement in college.

.11 Percentage of annual lighting power requirements met through LED bulbs.

Types of Lightings	College Premises	Azad Hostel	Total
LED Lighting Load	24191	2498	26689
Conventional Lighting Load	22036	3800	25836
Total Lighting Load	46227	6298	52525
Percentage of annual lighting power requirements met through LED bulbs			51

Table 18 : Percentage of annual lighting power requirements met through LED bulbs

Graphical Representation of Percentage of annual lighting power requirements met through LED bulbs

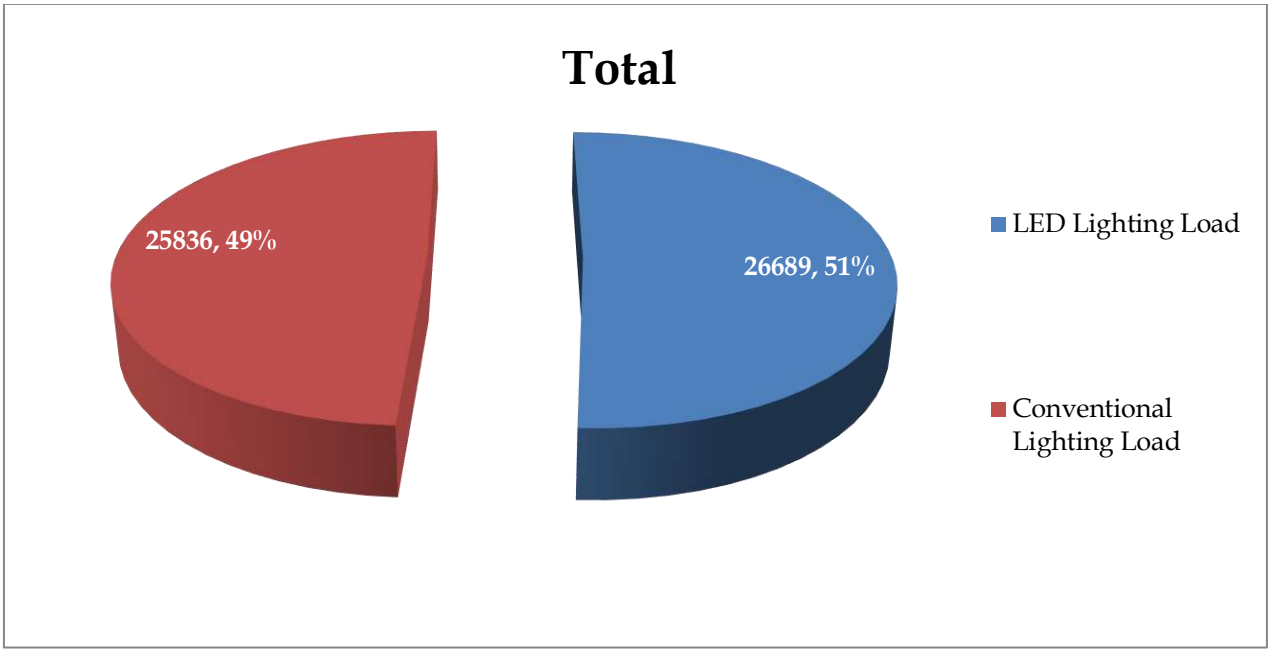


Figure 7: Graphical Representation of Percentage of annual lighting power requirements met through LED bulbs

Thus, LED lighting covers 51% of total lighting power requirement.

8.12 College Activities in Energy Management

1) Installation of Motion Detectors in college premises

It has been estimated that a single unit of energy saved at the end use point is equal to 2.3 units of energy produced. Keeping this in mind, College has installed motion sensors at different important rooms in college.

Motion sensors automatically turn outdoor lights on when they detect motion and turn them off a short while later. They are very useful for outdoor security and utility lighting as seen from above pictures.

Brief Introduction of Motion Detectors :

They can detect the Infrared Rays released by human body. The light or any other electrical appliance can be activated automatically by the active presence of a human body within the detection range / coverage area & when there is no presence the light will be deactivated automatically.

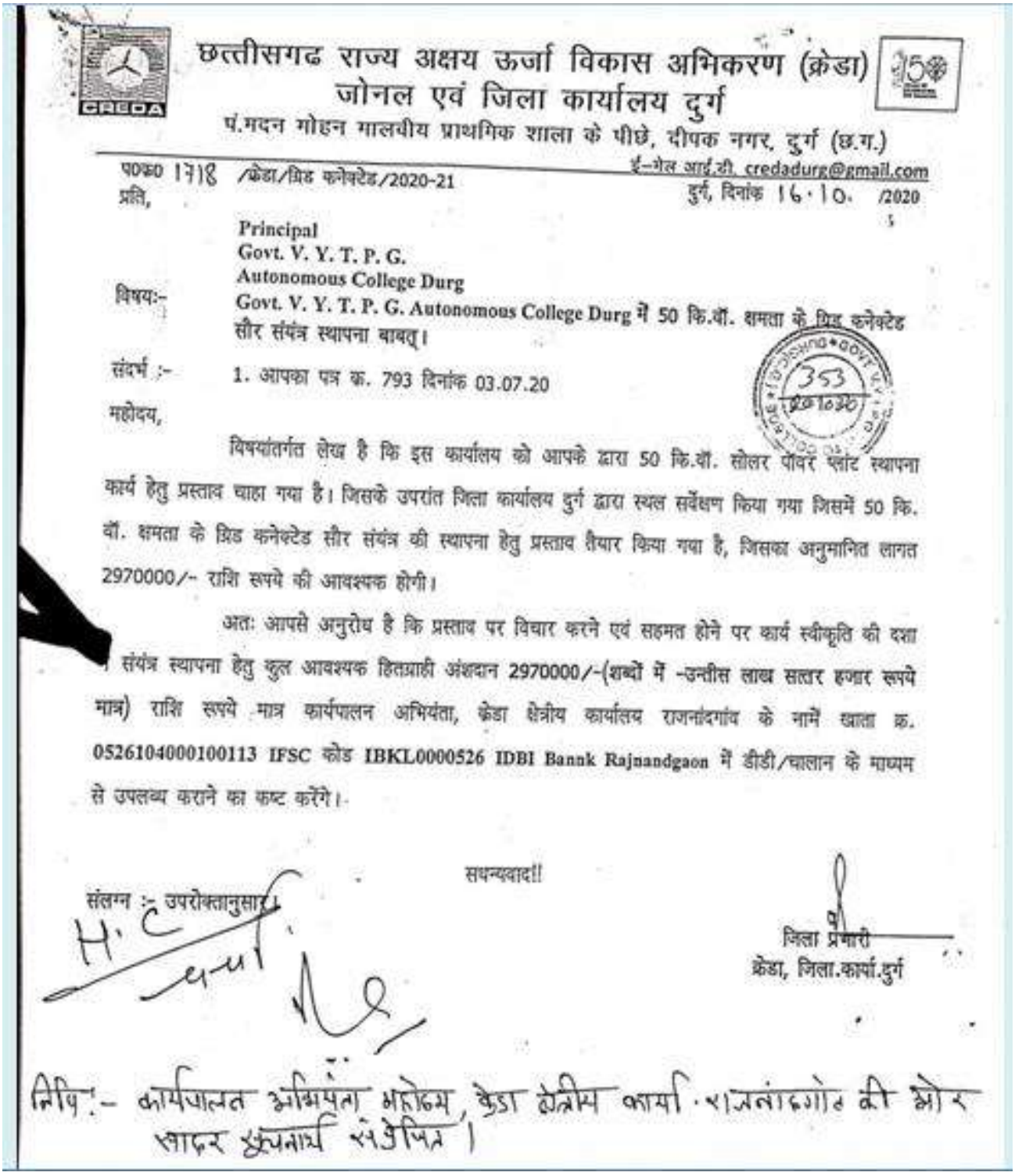
Control of lights through motion-sensors may also be appropriate for areas that are periodically used throughout the day. Typical uses may be; single occupancy offices, hall, bathrooms and staffrooms. By automatically turning off after a few minutes, they avoid wasted energy use and help conserve resources. These sensors have many benefits given below

- Allow significant savings on energy bills
- Cheap and simple to install, particularly wireless systems
- User-friendly
- Convenient lights switched on automatically when needed
- Long battery life due to their low power consumption
- Help with health and safety requirements (e.g. lighting in corridors) Therefore, Control of lights through motion-sensors has been installed in our college for energy saving.

Motion sensors automatically turn outdoor lights on when they detect motion and turn them off a short while later. They are very useful for outdoor security and utility lighting as seen from above pictures.

2) Proposed Plan for Installation of Grid Connected Solar Power Plant

Govt. VYT PG Autonomous College has planned to install a grid connected solar power plant of 50 KW capacity. CREDA (A State Designated Agency of Bureau of Energy Efficiency, New Delhi) is principally agreed for installation of solar power plant . The paper work is under process.



छत्तीसगढ राज्य अक्षय ऊर्जा विकास अभिकरण (क्रेडा)
जोनल एवं जिला कार्यालय दुर्ग
पं.मदन मोहन मालवीय प्राथमिक शाला के पीछे, दीपक नगर, दुर्ग (छ.ग.)
ई-मेल आई.डी. credadurg@gmail.com

पत्रक 1718 /क्रेडा/ग्रिड कनेक्टेड/2020-21 दुर्ग, दिनांक 16.10. /2020

प्रति,
Principal
Govt. V. Y. T. P. G.
Autonomous College Durg

विषयः- Govt. V. Y. T. P. G. Autonomous College Durg में 50 कि.वॉ. क्षमता के ग्रिड कनेक्टेड सौर संयंत्र स्थापना बाबत्।

संदर्भ :- 1. आपका पत्र क. 793 दिनांक 03.07.20

महोदय,

विषयांतर्गत लेख है कि इस कार्यालय को आपके द्वारा 50 कि.वॉ. सोलर पॉवर प्लांट स्थापना कार्य हेतु प्रस्ताव चाहा गया है। जिसके उपरांत जिला कार्यालय दुर्ग द्वारा स्थल सर्वेक्षण किया गया जिसमें 50 कि. वॉ. क्षमता के ग्रिड कनेक्टेड सौर संयंत्र की स्थापना हेतु प्रस्ताव तैयार किया गया है, जिसका अनुमानित लागत 2970000/- राशि रुपये की आवश्यक होगी।

अतः आपसे अनुरोध है कि प्रस्ताव पर विचार करने एवं सहमत होने पर कार्य स्वीकृति की दशा में संयंत्र स्थापना हेतु कुल आवश्यक हितग्राही अंशदान 2970000/-(शब्दों में -उनतीस लाख सत्तर हजार रुपये मात्र) राशि रुपये मात्र कार्यपालन अभियंता, क्रेडा क्षेत्रीय कार्यालय राजनांदगांव के नामें खाता क. 0526104000100113 IFSC कोड IBKL0000526 IDBI Bank Rajnandgaon में डीडी/चालान के माध्यम से उपलब्ध कराने का कष्ट करेंगे।

सधन्यवाद!!

संलग्न :- उपरोक्तानुसार।

जिला प्रभारी
क्रेडा, जिला.कार्या.दुर्ग

निवि:- कार्यपालन अभियंता महोदय, क्रेडा क्षेत्रीय कार्या. राजनांदगांव की ओर सादर सूचनार्थ संप्रेषित।

ऊर्जा की बचत के लिए जागरुकता जरूरी: तिवारी

हरिभूमि न्यूज ▶▶ दुर्ग

भौतिक शास्त्र विभाग में भौतिक परिषद का उद्घाटन हुआ। कार्यक्रम की शुरुआत कार्यक्रम के मुख्य अतिथि संजय तिवारी एसओएस इलेक्ट्रानिक्स एण्ड फोटानिक्स

■ ऊर्जा की आवश्यकता व उपयोगिता की दी जानकारी

विभाग, पंडित रविशंकर शुक्ल विश्वविद्यालय, रायपुर तथा कार्यक्रम की अध्यक्षता डॉ ओ.पी. गुप्ता विभागाध्यक्ष कॉमर्स का स्वागत पुष्पगुच्छ द्वारा विभागाध्यक्ष डॉ पूर्णा बोस ने किया। डॉ तिवारी ने अपने व्याख्यान के दौरान ऊर्जा की आवश्यकता एवं उपयोगिता पर अपने विचार प्रस्तुत किए। उन्होंने बताया कि प्रत्येक व्यक्ति को ऊर्जा की बचत के साथ-साथ ऊर्जा के उत्पादन के बारे में सोचना चाहिए। ऊर्जा उत्पादन के लिये उन्होंने विभिन्न परंपरागत स्रोत, रेनुवल ऊर्जा एवं सौलर सेल के बारे में विधिवत बताया। अभी अवाइड मीनिमाइज जनरेट (एएमजी) नहीं किया तो भविष्य में ओ मॉय गॉड (ओ.एम.जी) करना पड़ेगा।

भौतिक परिषद के उद्घाटन के बाद डॉ अनिता शुक्ला प्रभारी भौतिक परिषद ने सचिव एवं सहसचिव के नामों की घोषणा की। एम.एससी तृतीय सेमेस्टर से लक्ष्मी प्रसाद मिश्रा सचिव तथा एमएससी प्रथम सेमेस्टर से अदिति सिंह को सहसचिव बनाया गया। इसके बाद भौतिक विभाग में विभिन्न प्रतियोगिताओं में विजयी प्रतिभागियों को पुरस्कृत किया गया। निबंध प्रतियोगिता में प्रथम स्थान डोमिनलता, प्रतीक्षा एवं लक्ष्मी प्रसाद जबकि द्वितीय स्थान शैलेष, रोहित एवं लीना सुधाकर प्राप्त हुआ। पोस्टर प्रतियोगिता में प्रथम, द्वितीय एवं तृतीय स्थान समता, रोहित इक्का तथा ओजस्वी वर्मा ने प्राप्त किया। पावर प्वाइंट प्रतियोगिता में प्रथम, द्वितीय एवं तृतीय स्थान प्रतीक्षा प्रिंस एवं आकर्षित ने प्राप्त किया। कार्यक्रम के दौरान डॉ जगजीत कौर सलूजा, डॉ आर.एस.सिंह, सितेश्वरी चन्द्राकर, डॉ अभिषेक मिश्रा उपस्थित रहें। मंच का संचालन प्रतीक्षा तिवारी ने किया तथा धन्यवाद ज्ञापन लक्ष्मी प्रसाद ने दी। इसके साथ एम.एससी प्रथम एवं तृतीय सेमेस्टर के विद्यार्थियों द्वारा भौतिक शास्त्र विभाग में वृक्षारोपण भी किया गया। प्राचार्य डॉ आर.एन. सिंह ने विजयी प्रतिभागियों को बधाई दी।

अभी एएमजी नहीं किया तो भविष्य में ओएमजी करना पड़ेगा : डॉ. तिवारी

September 27, 2019 | Career, Education | No comments

दुर्ग साइंस कालेज में भौतिक परिषद का उद्घाटन

दुर्ग। वीवायटी पीजी कालेज के भौतिक शास्त्र विभाग में भौतिक परिषद का उद्घाटन हुआ। मुख्य अतिथि संजय तिवारी एसओएस इलेक्ट्रानिक्स एण्ड फोटानिक्स विभाग, पंडित रविशंकर शुक्ल विश्वविद्यालय, रायपुर ने ऊर्जा की आवष्यकता एवं उपयोगिता पर अपने विचार प्रस्तुत किये। उन्होंने बताया कि प्रत्येक व्यक्ति को ऊर्जा की बचत के साथ-साथ ऊर्जा के उत्पादन के बारे में सोचना चाहिए। उन्होंने विभिन्न परंपरागत स्रोत, रिनुएवल ऊर्जा एवं सोलर सेल की चर्चा की। डॉ. तिवारी ने कहा कि अभी अवाइड-मीनिमाइज-जनरेट (एएमजी) नहीं किया तो भविष्य में ओ-मॉय-गॉड (ओएमजी) करना पड़ेगा।

Water Management

- **Auditing for Water Management of the institute for Environmental Consciousness and Sustainability**

- **Rain water harvesting structures and utilization in the campus**

9. WATER MANAGEMENT

This indicator addresses water consumption, water sources, irrigation, storm water, appliances and fixtures. Aquifer depletion and water contamination are taking place at unprecedented rates. It is therefore essential that any environmentally responsible institution should examine its water use practices.

Govt. VYT PG Autonomous College, Durg gets water from municipal Corporation, Durg and one ground water bore well sources. There are two sump well. The upper surface area of one of the sump well is circular and another is in square form.

Sump well	Cubic Feet	Water Storage Capacity in Litre
Circular	1766	50008
Squared	1000	28317
Total Capacity		78,325

Table 19: Total Water storage capacity of sump wells

Two submersible pumps having rating of 5 HP & 3 HP are operated to lift water from sump well and one submersible pump of 1 HP capacity is dedicatedly operated for gardening. College has presently 14 nos. Over head water storage tanks each having capacity of 1000 litre. Thus college have total 36000 litre of water storage capacity.

College

Sl. No.	Water Tank Capacity	Numbers	Total Capacity
Old Building			
1	5000	4	20000
2	2000	2	4000
3	1000	4	4000
Total Consumption of water in Litre			28000
New Building			
3	2000	4	8000
Total Capacity in Litre			36000

Table 20 : Overhead water storage tank capacity in college

Azad Hostel

Sl. No.	Water Tank Capacity	Numbers	Total Capacity
1	1000	1	1000
2	1000	5	5000
3	2000	1	2000
Total Capacity in Litre			8000

Table 21 : Overhead water storage tank capacity in hostel

Quantities of water taps and water coolers

Description	College	Hostel
Water Taps	321	79
Water Coolers	10	6

9.1 Water Consumption

Water Audit at Govt. VYT PG Autonomous College, Durg					
1	2	3	4	5	6
Activity	**Average litres of water used per activity in litres**	**Number of times activity done each day**	**Total water used by a person each day (litres)**	**Number of people in the College using water**	**Water Consumption per day**
College Premises					
Wash hands and face	1.5 litres	One times a day	1.5	1600	2400
Bath	60-120	once	90	6	540
Toilet / Urinal flush	6 To 21	once	6	1800	10800
Drinking	0.4	Three	1.2	4800	5760
Washing dishes (hand)	Basin	Four	4	1200	4800
Laboratory					500
Overflow of water & Leakage	300			-	400
Gardening	1600	once	1600	1	1600
Canteen	1		1	1200	1200
Total Consumption of water in litre (A)					28000
Azad Hostel					
Overflow of water& leakage	120	2			240
Hostel (Wash hands and face)	1.25 litres	Two times a day	2.5	160	400
Hostel (Bath)	60-120	once	85	160	13600
Hostel (Toilet flush)	6 To 21	once	6	160	960
Hostel Washing dishes (hand)	Basin	Once	1	160	160
Hostel Drinking (cup)	0.4	10 Times	4	160	640
Total Consumption of water in liter (B)					16000
Total water consumption in college [Sum of (A) and (B)]					44000

Table 22 : Total water consumption in college

9.2 Rain Water Harvesting System

Rainwater harvesting is a technology used to collect, convey and store rain water for later use from relatively clean surfaces such as a roof, land surface or rock catchment. RWH is the technique of collecting water from roof, Filtering and storing for further uses. Rainwater Harvesting is a simple technique of catching and holding rainwater where its falls. Either, we can store it in tanks for further use or we can use it to recharge

groundwater depending upon the situation. RWH system provides sources of soft, high quality water reduces dependence on well and other sources and in many contexts are cost effective.

9.3 Rain Water Harvesting System at Govt. VYT PG Autonomous College

The college has a rain water harvesting system Other buildings can be connected , though more pits are required for the same.

Location of Rain water harvesting system	Area of roof in Sq. Ft.
Sports Department	4200
New Building	7223
Tagore Hall	4260
Girls Common	5772
Total Area	21455

Table 23 : Area of roof for rain water harvesting system.

9.4 Amount of water received through rain

Open roof area (A)	1993 Sq. Meter
Average rain fall per square meter in Bhilai (B)	1200 mm or 1.20 Meter
Amount of water received through rain (C = A x B)	2392 Cu. Meter
Run off Coefficient factor through rain (D)	0.80
Total water received (E =C x D)	1912 Cu. Meter

Table 24: Amount of water received through rain

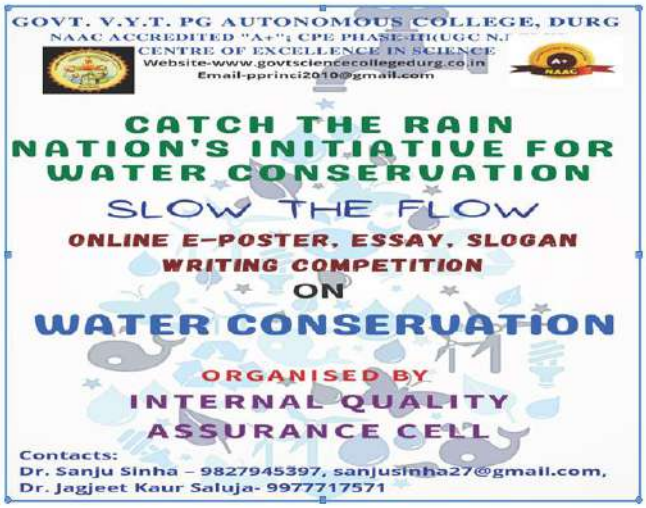
Under Jal Shakti Abhiyan -2019, college has made efforts to ensure water conservation and water harvesting. The campaign has been channelized with the Motto "Be Water Smart, Every Drop Counts" following the 3R principle - Reduce, Reuse and Recharge.

9.5 Other Activities of College in Water Management

9.5.1 Water Harvesting/Conservation Awareness Drive

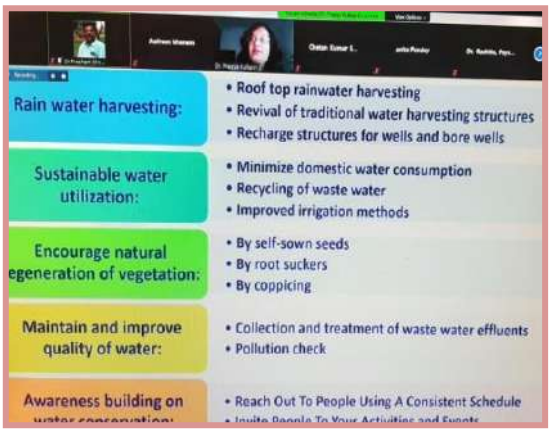
A. Constitution of Eco-club: An Eco-club has been constituted to sensitize students towards environmental issues through various activities. On the occasion of World Earth Day, an ignition programme was organized by Eco-Club on 20-22 April, 2021. Competitions under three categories – Concept note, Poster and Graphical Abstract on various themes to ignite the young generation to ensure future prospects of Restoration of Earth was organized which was evaluated by a team of jury members.

B. To create **awareness of water conservation and water harvesting** among students, several competitions like **Slogan competition, Poster competition, Essay competition,** etc have been organized on 27 May, 2021 with the theme **"Slow the Flow"** and were met with massive participation. All the participants were provided with e-certificates for participation along with special Winner e-certificates to the top three rank holders.



Participation of VYT PG Autonomous College, Durg on University Level Competitions:

a. Three faculty members contributed in oral presentation competition on Water Conservation conducted by Hemchand Yadav University, Durg.



- Dr. Neeru Agrawal: Conserving household waste water by putting it to alternate domestic use.
- Dr. Pragya Kulkarni: Water conservation – Grounding and approach
- Prof. Mausumi Dey: Use and reuse of Grey Water

b. Many students participated in various competitions organized with the aegis of Water conservation at University level.

9.5.2 Wastewater Management

C. Waste water discharge from the canteen is directed to a small tank named Lotus tank. It is surrounded by a wire mesh. The tank contains a variety of eye catching aquatic plants. Water of this pond is used to irrigate the nearby seasonal plant beds.

D. A temporary pond has been constructed beside the girls hostel to collect the water from Railway washing yard located near the college campus. The pond serve as a recharge point source for underground water as well as while some of it is used for on-site construction and irrigation of plants spread across the college campus.

E. More than 10 water purifiers are installed at various sites throughout the college campus. Waste water from these purifier outlets is used to water various indoor and outdoor plants to ensure least water wastage and beautification of the campus.

F. Potted plants have been placed below the outlets of Air Conditioners so that the water discharge from these outlets can be utilized properly.

9.5.3 National Webinar on Water Conservation

A. World Environment Day was observed by organizing a two-day National Webinar on 6-7 June, 2021 with the theme "Ecosystem Restoration" wherein resource persons across the nation drew the attention of the audience towards the alarming consequences of uneconomical use of water and water pollution. They emphasized restoring the ecosystem by aiming to 'use minimum and give maximum'. More than 500 participants from 12 states attended the Webinar and got benefitted from the lecture series and attained new insights on the issue after brainstorming discussions with highly esteemed experts of many diverse fields.

Waste Management

- **Auditing for Waste Management of the institute for Environmental Consciousness and Sustainability.**
- **Waste Management steps including: • Solid waste management • Liquid waste management • E-waste management**

10. WASTE MANAGEMENT

This indicator addresses waste production and disposal, plastic waste, paper waste, food waste, and recycling. Municipal solid waste has a number of adverse environmental impacts, most of which are well known and not in need of elaboration. To reduce waste at institute, students and staff are educated on proper waste management practices through lectures, advertisement on notice boards, displaying slogan boards in the campus.

Waste is collected on a daily basis from various sources and is separated as **dry and wet waste**. Colour coded dustbins are used for different types of wastes. Green for wet and blue for solid waste.

Daily garbage is collected by housekeeping personnel and handed over to authorized personnel of Municipal Corporation, Durg for further processing.

10.1 Solid Waste management

Solid waste can be divided into two categories: general waste and hazardous waste. General waste includes what is usually thrown away in homes and schools such as paper, plastics tins and glass bottles. Hazardous waste is waste that is likely to be a threat to one's health or the environment like cleaning chemicals and petrol. Small bucket and big buckets are used for solid waste.

Small Plastic bucket = 40 Nos.
Big Plastic Bucket = 20 Nos.
Total Production of Solid Waste (Bio degradable) : 2-10 Kg

Total Production of Solid Waste (Non Bio degradable) : Less than 1 Kg

College also have two numbers of Napkins/Wending/Burning Machine

10.1.1 Non Bio degradable Waste – Plastic Bottles / Waste Paper etc.

- Non- biodegradable are those waste, which cannot be decomposed by biological processes . These are of two types - Recyclable: waste having economic values but destined for disposal can be recovered and reused along

with their energy value. e.g. Plastic, paper, old cloth etc. Non-recyclable: waste which do not have economic value of recovery. e.g. Carbon paper, thermocol,

tetra packs etc. Disposal of non-biodegradable waste is a major concern, not just plastic, a variety of waste being accumulated. There are a few ways to help non-biodegradable waste management. The impact of non-biodegradable waste on the environment and also focus on its safe disposal for sustainable environment.

Waste material like plastic, papers etc. are collected and sold out to scrap vendor from time to time.

- College has also planned for compost pit to produce compost manure from the canteen solid waste and waste from other sources. Manure will be used for the purpose of botanical garden, Swami Vivekanand Garden, herbal garden as well or for planted tree.

10.2 Liquid waste management:

The waste chemicals mixed water from laboratory should not be mixed with ground water. Labs are bringing to adopt fully or to minimize hazardous chemical.

10.2.1 Re-use of waste water

Waste water discharge from the canteen Is directed to a small tank (Oxidation pond) named Lotus tank. It is surrounded by a wire mesh. The tank contains a variety of eye catching aquatic plants. Water of this pond is used to irrigate the nearby seasonal plant beds.

a.Re-use of waste water from surrounding area

A temporary pond has been constructed beside the girls hostel to collect the water from Railway washing yard located near the college campus. The pond serve as a recharge point source for underground water as well as while some of it is used for on-site construction and irrigation of plants spread across the college campus.

b. **Re-use of impure wastewater from water purifiers ,**

Impure drinking water is one of the main sources of infection, even mild poisoning, in many cases. Hence, it is important to use water purifiers in college campus. About 16 water purifiers are installed at various sites throughout the college campus. Waste water from these purifier outlets is used to water various indoor and outdoor plants to ensure least water wastage and beautification of the campus.

c. Re-use of waste water from Air Conditioners

Potted plants have been placed below the outlets of Air Conditioners so that the water discharge from these outlets can be utilized properly.

10.3 E-Waste Management

Waste Electrical and Electronic Equipment (WEEE) or E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste on an average.

In developing countries, it ranges from 0.01% to 1% of the total municipal solid waste generation. In countries like China and India, though annual generation per capita is less than 1 kg, it is growing at an exponential pace. Presently, a very small amount of E waste from offices and glass waste from labs is generated in College.

The E-waste collected is stored in store room and disposed every year by selling it to vendors .

The total e-waste kept in college is about 30 Kg.

The Level of disturbance it creates for the college in a scale 1 to 9.

Sl. No.	Area	Rating
1	Municipal Dump Yard	9
2	Garbage heap	9
3	Sewer line	8
4	Stagnant water	9
5	Open drainage	7
6	Industry	No
7	Bus/Railway station	1
8	Market/shopping complex/ Public halls	3

10.4 Environment Management Policy: Leading the way to a cleaner and healthier Environment

- Reducing degradable and non-degradable waste in the campus
- Reducing pollution through gases, heat, odor, chemicals and hazardous microorganisms
- Reducing water consumption and wastage
- Appropriate training to staff and students for environmental awareness through academic programmes and campus awareness initiatives
- Facilitation of research in sustainability

Identification And Evaluation of Environmental Aspects and Associated Impacts:

Activity	Aspect	Risk Levels*			Effect on reception				Impact
		P	D	A	EH	EA	EW	EL	
Department of Physics & Computer Science									
Running of electrical, electronic and heat radiating instruments	Electrical consumption, heat radiation, Generation of electronic waste	5	1	1	-	√	-	√	Air and Land Pollution
Department of Chemistry									
Experiments on Chemical reactions	Generation of fumes and chemical waste	5	5	5	√	√	√	√	Effect on health, Air, Water and Land pollution
Storage of strong chemicals and Acids	Leakage of gases and out flow of chemicals	5	3	1	√	√	-	-	Air pollution
LPG for burners in laboratories	Generation of heat	5	3	3	√	√	-	-	Air pollution
Use of Glass wares	Chances of breakage and generation of	5	3	1	√	-	-	√	Land pollution

	waste								
Running of electrical, and heat, vibration and noise generating instruments	Electrical consumption, heat radiation, generation of noise	5	4	2	√	√	-	-	Air and Noise pollution
Department of Botany									
Experiments on Plants	Generation of waste	4	2	1	-	-	√	√	Land pollution
Use of Glass wares and plastic wares	Chances of breakage and generation of waste	5	3	1	√	-	-	√	Land pollution
Use of chemicals and reagents during experiments	Generation of waste water with spent chemicals	5	3	3	-	-	√	√	Water and Land pollution
Department of Zoology									
Experiments leading to staining and preservation of animal parts	Generation of waste water with spent chemicals	5	3	3	-	-	√	√	Water and Land pollution
Experiments on animal cells like blood, fish scales, skin peelings, saliva etc.	Generation of liquid waste	5	3	1	-	-	√	√	Water and Land pollution
Department of Microbiology									
Experiments on living Microorganisms	Generation of infectious propagules	5	3	3	√	√	√	√	Effect on health, Air, Water and Land pollution
Use of strong chemicals, reagents and media ingrediants for washing and disinfection	Generation of aerosol and release of liquid waste	3	2	2	√	√	√	√	Air, Water and Land pollution
Preservation and	Generation of aerosol	3	2	1	√	√	-	-	Air pollution

maintenance of pure cultures of microorganisms									
Use of Glass wares, plastic wares, cotton, aluminium foil and disposable tools	Chances of breakage and generation of solid waste	5	3	1	√	-	-	√	Land pollution
Department of Biotechnology									
Experiments on plants, animals and microorganisms	Generation of waste	3	1	1	-	-	-	√	Land pollution
Use of carcinogenic chemicals like ETBr, Silica gel, Glass wool for experiments	Generation of insecure waste	3	1	1	√	-	√	√	Effect on health and Land pollution
Use of Glass wares, plastic wares and disposable tools	Chances of breakage and generation of waste	5	3	1	√	-	-	√	Land pollution
Use of strong chemicals for washing and disinfection	Generation of aerosol	3	2	2	√	√	√	√	Air, Water and Land pollution
Department of Geology									
Preparation of thin sections of rocks and minerals	Generation of dust, sound and vibration	3	3	3	√	√	√	√	Air, Water and Land pollution
Geological excursion and field work for collection and preservation of museum specimens	Accumulation of plastic bags and place congestion	3	3	1	-	-	-	√	Generation of Degradable and Non- degradable solid waste, Land pollution
Departments of Arts, Social Science, Commerce & Mathematics									
Maintenance of files and registers	Generation of Paper waste	1	1	1	-	-	-	√	Generation of degradable Solid Waste, Land Pollution
Department of Library Science									

Maintenance of reference books, Catalogues and files and registers; Footfall of students and staff	Generation of paper waste and dust aerosol	2	3	2	√	√	-	√	Air and land Pollution
All departments including office									
Use of computer, laptops and Wi-Fi, Running of refrigerators, Deep refrigerators and Air conditioners	Electrical consumption, Generation of electronic waste and Heat	4	2	2	√	√	√	√	Generation of e Waste causing Air and Land Pollution

P – Probability of occurrence	**EH – Effect on Human**
D – Duration of occurrence	**EA – Effect on Air**
A – Area of influence	**EW – Effect on Water**
	EL – Effect on Land

Table : 25 : Identification And Evaluation of Environmental Aspects and Associated Impacts

***Risk levels: 1-5 Mild to Very High**

10.5. Corrective Measure Adopted by Departments & Offices

Department	Measures adopted	Impression
Physics	Use of energy conservation devises, Promotion of paper less work, Reduction in e-waste	Safety during experimentation, power saving, reduction in solid waste
Chemistry	Compulsion of lab coats, Installation of exhaust fans in laboratory, provision of fume hoods for sensitive experiments, Wooden and stone-based storage cabinets, annual maintenance of gas pipe lines and exhaust fans, diffusion of aerosols into liquid chambers to minimize the thresholds, regeneration of Silver from waste silver chloride collected during experiments	Safety during experimentation, rapid removal of troubling exhausts, limited spread of smokes, slowdown of metal corrosion, no leakage of gas, reduction in diffusion of unwanted undesirables
Botany	Timely disposal of spent materials, periodic cleaning and disinfection of tools, equipment and microscope,	Limited accumulation of waste, limited risk of health hazards
Zoology	Use of lab coats during experiments, land filling of animal waste and neutralization of strong chemicals before release in the environment	Restricted accumulation of waste, limited risk of health hazards
Geology	Separate chambers for thin section preparation during experiments, Minimal use of plastic bags and proper	Reduction in surrounding depraved impact

	disposal after use	
Microbiology	Compulsion of Lab coats and hand gloves during experiments, use of biosafety cabinets during microbial transfer, Separate storage compartments for bacteria and fungi, Separate area for decontamination and washing, periodic cleaning and disinfection of working area, microscopes, deep refrigerators and incubators	Safety and protection during experimentation, Reduction of generation of microbial aerosol, less chances of cross contamination during experiments, limited risk of health hazards
Biotechnology	Compulsion of Lab coats and hand gloves during experiments, use of biosafety cabinets during microbial transfer, Separate storage compartments for bacteria and fungi, well defined area for germplasm storage, Separate area for decontamination and washing, land filling of unsafe materials, periodic cleaning and disinfection of microscopes, deep refrigerators and incubators.	Safety during experimentation, Reduction of generation of microbial aerosol, less chances of cross contamination during experiments, limited risk of health hazards
Arts, Social science, Commerce & Mathematics	Segregation of paper and disposable plastic waste in separate bins and daily transfer to landfill area.	Reduction in the accumulated waste
Library Science	Continuous running of exhaust fans, consistent dusting and sweeping through vacuum cleaners, regular disposal of paper waste	Reduction of aerosol generation, reduced damage due to insect pests, limited risk of health hazard

Measures Adopted	Impression
a) Organization of awareness campaigns and promotion of green attitude through physical displays, awareness lectures	**a) Acquiring the knowledge and importance of environment, ensuing environmental protection rules, development of necessary environmental and health related skills, and values, understanding the concept of grey water and continuous education to focus Reduce, Reuse & Recycle**
b) Regular plantation, maintenance of	**b) Sustenance of Green environment in**

plants having air purification properties are preferred near conference room and laboratories.	the campus
C) Introduction of uniform solid waste management system through segregation bins and landfills.	c) Reduction in the amount of solid waste generated and environmental waste burden in the campus
d) Provision of sanitary napkin dispensers in girl's common room and efficient disposal of waste through incinerators	d) No accumulation of waste
e) Regular monitoring of overhead water storage PVC tanks for leakage, accumulation of water nearby and proper closure of lid	e)Effective and efficient use of efflux water for gardening, washing and mopping. No entry and accumulation for litter and overflowed water near overhead water tanks and rarer possibility of mosquito breeding around the area
f) Rain water harvesting for judicious utilization of natural water resource through channelization of roof top rain water for ground water recharge.	f) 'Catch the rain where it falls' supporting ground water recharge in support of water recycling
g) Safe and systematic management of laboratory waste through neutralization of strong acids and alkali before draining, cooking out infectious prop gules before disposing	g) Maintaining ecosystem balance
h) Collection of e-waste from departments and selling in the scrap market through proper channel. Periodic collection of valued answer books, student's practical files, home assignments and test papers and other paper waste from departments, written off books from library and selling in scrap market	h) Selling paper waste and e-waste generate revenue for institution

- **Green Campus Management and Carbon Footprint of the institute for Environmental Consciousness and Sustainability.**
- **Green Practices**
- **Students, staff using a) Bicycles b) Public Transport c) Pedestrian friendly roads**
- **Plastic-free campus**
- **Paperless office**
- **Green landscaping with trees and plants**

11. GREEN CAMPUS MANAGEMENT

All plant and animal species - including humans - are linked together in a complex web of life; we depend upon biodiversity for our survival. Biodiversity is the key to healthy ecosystems and ultimately a healthy planet. It keeps the air and water clean, regulates our climate and provides us food, shelter, clothing, medicine and other useful products. Each part within this complex web diminishes a little when one part weakens or disappears.

Area under green cover (in sq ft or in acre)	8.6 acre
Availability of Nursery on Campus (Yes / No)	Yes
Plant Protection Management	Yes
Number of plantations done in the year 2020-21	273
Extent of area (% of area) under tree cover	22%

Table 26 : Green Area management

The trees work hard to keep the air we breathe clean and healthy. They are like sponges. Their leaves take in much of the poisonous unwanted carbon dioxide in the air, and replace it with the oxygen we need for healthy living. This system of absorbing gases on which all plants rely for their food is called photosynthesis. In this process, the plants with the help of sunlight, water, minerals and the green material called Chlorophyll within the leaves change the carbon-dioxide into food for themselves. When doing this they release oxygen into the air which is vital for all life on earth. At night when there is no sunlight the plant no longer makes food, so it does not release the same amount of oxygen.

One is often told not to sleep with plants in one's room, as they will use up all the oxygen. However, at night although photosynthesis does take place the plants also rest, so that little oxygen is absorbed from the air and very little harm can be done to the ones sleeping in the room

The roots of trees dig deep into the earth and hold it together so that the rain and wind cannot wash or blow it away. This is very important as the earth has only a very thin layer (seldom more than one foot) of fertile soil covering it. If this is washed, blown or worn away leaving rock or sand on which no plants can grow then the earth would become a desert. The removal of this top-soil is called soil erosion. Scientists, all over the world are trying to find ways to prevent soil erosion. One of the most important ways is creating by planting more trees.

Trees send up water vapour into the atmosphere through their leaves. When this vapour meets the cool air above it turns into drops of water which then fall as rain. They give us beauty, colour and greenery. This is something which we often forget and fail to appreciate. They are the homes of many birds, animals and insects. Each of these is important in maintaining the balance of nature.

11.1 Green Audit

Green Audit defined as documented, verification process of specified environmental activities, events, conditions, management system. Green Audit can create awareness in college staff as well as students which are our responsibility too, to save our environment and also can find the ways to improve environmental issues which are increasing day by day. Environmental problems such as recycling of waste, water conservation and recycling, pollution control, plantation, biodiversity conservation etc. can solve through Green Auditing. Good growth come from good education as well as good mental and physical health if we protect our environment, we can also protect our health.

Green Audit means of assessing environmental performance. It is a systematic documented periodic, and objective review by regulated entities of facility operationsand practices related to meeting environmental requirement. It is otherwise thesystematic examination of the interactions between any operation and its surroundings. This includes all emissions to air, land and water, legal constraints, the effects on the neighbouring community, landscape and ecology, the public's perception of the operating company in the local area. Green audit does not stop all compliance with legislation. Nor is it a 'green washing' public relations exercise. Rather it is a total strategic approach to the organisation's activities.

VISION

To empower the youth, especially belonging to the underprivileged sections of society, through quality education by inculcating philanthropic values and enabling them to meet the challenges of the contemporary knowledge society.

MISSION

To translate the vision into reality the institution is committed to -

- Embrace in its fold students from all sections and categories especially addressing to the needs of thefirst generations learner.
- Expose the students (especially the under-privileged ones) to variety of activities, academic and extra-academic, aiming at their overall development.
- Inculcate humanistic and social values in the students to motivate them towards community services.
- Kindle the entrepreneurial spirit in students.
- Inspire the young minds to develop the habits of critical thinking to achieve Creative Excellence.
- Promote quality research among the teachers and students.
- Sensitize the students on issues relating to ecology, environment, human rights and gender equality.
- Foster global competencies.

College Green Committee

The college Green committee was established in the college with a proactive attitude towards conservation of the environment and objective of generating awareness and promoting environmental care at both individual and community level. The committee aims to create a permeating atmosphere facilitating conversation, action and feedback on environmental issues engaging faculty, students and the general public. The institution looks at the macro- environmental perspective in the college and the society and envisions nurturing the environmentwith a greener future.

11.2 Green Campus Policy of College

Govt. V. Y. T. PG. Autonomous College, Durg is committed to develop its campuses as places where education is combined with environmental friendly practices to promote Sustainable Development by o restricted entry of automobiles, promoting the use of Bicycles and provision of Pedestrian Friendly pathways e ban on use of disposable Plastics in line with the State

Government Guidelines. creating awareness with stakeholders on the need for maintaining greenery in the campus for sustainable ambience.

encouraging all stakeholders to support and participate in ensuring green cover in the campus. o preserving age old trees and protect them to have prolonged life. enhancement of green cover by landscaping with trees and plants. conduct of green audit at regular intervals and implement the suggestions towards creating green campus .The faculty, staff and students are encouraged to contribute collectively to develop an eco-friendly sustainable campus and disseminate the concept of eco friendly culture to the nearby community and wherever possible.

Govt. V. Y. T. PG. Autonomous College, Durg envisions a clean and green university campus where ecological friendly practices and education combine to encourage sustainable and eco- friendly systems in the campus and beyond the campus. The green campus offers the organization a prospect to take the lead in redefining its green culture through promoting environmental ethics among students and staff The Institute also promotes clean and green campus through adopting, practicing and promoting environmentally friendly practices among students and staff to generate Eco consciousness among them and in the world around them.

Objectives of the policy : To compose students by understanding the importance of environment and its problem areas Important function of the policy .

- To train students to create responsiveness amongst public.
- To encourage students to keep environment safe and clean.
- To encourage students to adopt environment friendly practices which include paper bags, save .

- To help the students to minimize the use of polluting product.

Why Green Audit

The excessive environmental degradation is creating the "Environmental poverty". Thus, academic leaders should initiate the knowledge and benefits of resources so that their institutions respond to environmental issues and challenges. We believe that there is an urgent need to address these problems and reverse the trends of environment degradation.

OBJECTIVES -

- To assess environmental performance
- To promote environmental awareness
- To improve health
- To conserve resources
- To reduce waste
- To improve environmental standards
- To sustainable use of natural resources
- To develop responsibility about environment
- To enhance college profile

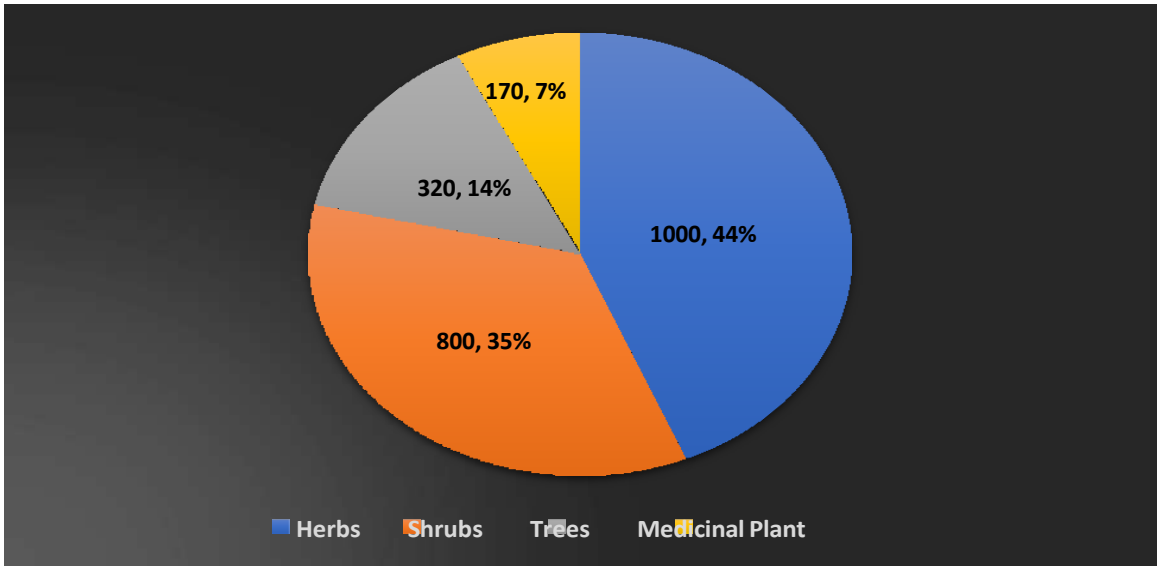
PLANTATION -

To create Environmental awareness at the college campus we organize plantation program with all the staffs and students of our college. We try to plant more trees. To keep the greeneries in the campus we maintain the garden by paid staff under the guidance of garden committee members.

To create- green cover, eco-friendly atmosphere, pure oxygen at the college campus, plantation program is organized every year with involving all students, principal, and all departments faculty members. In this session van mahotsav program was organized and about 100 ornamental, avenue,

medicinal plant with rare and exotic beautiful trees was planted in botanical garden and other parts of college campus. To keep the greeneries in the campus, we regularly maintain the gardens which are looked after by paid staff under the guidance of garden committee members. Moreover, every year we try to plant new trees. Seasonal flower garden is also a unique feature of this college. There are so many plants are present in our college campus categorized below-

Category	Numbers (Approx.)
Herbs	1000
Shrubs	800
Trees	320
Medicinal Plant	170



IDENTIFICATION OF PLANT SPECIES:

There are so many plant species are present at college campus. The faculty member of thebotany department audited and identified of various plant

species with the help of flora.

11.3 List Of The Plants Audited

S.No.	Scientific Plant	Local Name	Family	Uses	Nos.
1	*Acacia melanoxylon*	Australian acacia	Mimosaceae	Social Forestry	1
2	*Albizzia lebbeck*	Siris (Black)	Mimosaceae	Avenue Timber, Bronchitis,Tree, Skin,	4
3	*Alstoniascholaris*	Chhatim	Apocynaceae	Avenue Malaria, Tree,	27
4	*Anthocephalus cadamba*	Cadam	Rubiaceae	Avenue Aesthetic, Tree	1
5	*Azadiracta indica*	Neem	Meliaceae	Avenue Tree,Skin,	15
6	*Bauhania variegate*	Kachnar	Ceasalpiniaceae	Avenue Ornamental Tree	1
7	*Bixa orellana*	Sinduri	Bixaceae	Industrial Food	1
8	*Cassia fistula*	Amaltas	Ceasalpiniaceae	Avenue Tree, Laxative	27
9	*Cassia siamea*	Chakundi	Ceasalpiniaceae	Avenue Tree, Ornamental	2
10	*Casuarina equisetifolia*	Jhau	Cauarinaceae	Social Forestry, Diarrhea	2
11	*Cocos nucifera*	Narial	Palmaceae	Fruit Edible	1
12	*Dalbergia sissoo*	Sheesham	Papilionaceae	Avenue Tree, Timber,	31
13	*Delonix regia*	Gulmohar	Caesalpiniaceae	Avenue Tree, Ornamental	6
14	*Emblica officinalis*	Amala	Euphorbiaceae	Triphla, Skin,Tannins	2
15	*Ficus bengalensis*	Bargad	Moraceae	Avenue Tree, Aesthatic	3
16	*Jacaranda mimosifolia*	NilaGulmohar	Bignoniaceae	Ornamental	2
17	*Leucaena leucocephala*	Shubabul	Mimosaceae	Social Forestry, Fodder	14
18	*Mangifera indica*	Aam	Anacardiaceae	Avenue Tree, Fruit Edible, Timber	3

19	*Mimusopselengi*	Maulsiri	Sapotaceae	Avenue Tree, Ornamental	2
20	*Moringa oleifera*	Munaga	Moringaceae	Blood Pressure, Fruit Vegetable	1
21	*Nyctanthesarbo r-tristis*	Harsingar	Oleaceae	Ornamental, Diabetic	1
22	*Peltophorumferr ugineum*	Copper Pod	Caesalpiniaceae	Avenue Tree, Ornamental, Social Forestry	40
23	*Pithecolobium dulce*	Ganga Emli	Mimosaceae	Hedge,Fruit Edible	6
24	*Plumeria alba*	Temple Tree (Champa)	Apocynaceae	Ornamental	5
25	*Polyanthia longifolia*	Ashok	Annonaceae	Avenue Tree, Ornamental	6
26	*Pongamia pinnata*	Karanj	Papilionaceae	Avenue, Insecticide, Skin	28
27	*Syzygiumcuminii*	Jamun	Myrtaceae	Avenue, Diabetes, Fruit Edible, Timber	1
28	*Tabebuia rosea*	Trumpet Tree	Bignoniaceae	Ornamental	1
29	*Tabernaemont ana coronaria*	Chandni	Apocynaceae	Ornamental	2
30	*Tamarindus indica*	Imli	Caesalpiniaceae	Avenue, Fruit Editable	3
31	*Tecoma stans*	Yellow Bell	Bignoniaceae	Ornamental	10
32	*Tectona grandis*	Sagon	Verbenaceae	Furniture Of best Quality	4
33	*Thevetia peruviana*	Pili Kaner	Apocynaceae	Ornamental, Aesthetic	12
34	*Zizyphus jujube*	Ber	Rhamnaceae	Fruit Edible, Fodder	4

Medicinal Plants

S.No.	Scientific Name of Plant	Local Name	Family	Uses	Nos
1	*Adhatoda vasia*	Adusa	Acanthaceae	Espectorent	11
2	*Aloe vera*	Ghee Kwar	Liliaceae	Fever, Constipation, Piles, Skin, Jaundice, Leprosy	16

3	*Andrographis paniculata*	Kirayat	Acanthaceae	Fever, Dysentry, Dyspepsia, Stomachic	27
4	*Asparagus racemosus*	Satawar	Liliaceae	Tonic, Dysentry, Leprosy, T.B., Night Blindness	5
5	*Catharanthes roseus*	SadaSuhagan	Apocynaceae	Leukemia,Diabetic	22
6	*Cymbopogon citrates*	Lemon Grass	Poaceae	Bronchitis, Fever, Rheumatism, Leprosy	26
7	*Gymnema sylvestre*	Gurmar	Asclepiadaceae	Diabetic, Ulcer, Bronchitis, Piles, Snake Bite	11
8	*Oscimum sanctum*	Tulsi	Lamiaceae	Asthma, Bronchitis, Vomating, Malaria, Ring Worm	**14**
9	*Rauwolfia serpentine*	Sarpgandha	Apocynaceae	High Blood Pressure, Sebative, Mental Disorder, Anti-Microbial	**12**
10	*Tinospora cordifolia*	Giloey	Menispermaceae	Diabetic, Tonic	2
11	*Vitis quadriangularis*	Harjod	Vitaceae	Joint and Bone Health	**2**
12	*Withania somnifera*	Ashwagandha	Solanaceae	Asthma Bronchitis Arthritis, Rheumatism, Leucoderma	5

Table : 27 : List of the plant audited.

Particulars of Flora	**Numbers**
Full grown Tree	675
Semi Grown Tree	250
Quarter grown plants	128

Table 28 : Type and quantity of flora

11.4 Carbon Footprint

A carbon footprint is the amount of greenhouse gases—primarily carbon dioxide— released into the atmosphere by an individual, event, organization, service, or product, expressed as carbon dioxide equivalent. In addition to the water, waste, energy and biodiversity audits we can also determine what our carbon footprint is, based on the amount of carbon emissions created. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions.

An important aspect of doing an audit is to be able to measure our impact so that we can determine better ways to manage the impact. In addition to the water, waste, energy and biodiversity audits we can also determine what our carbon footprint is, based on the amount of carbon emissions created.

A) The following activity/utility is responsible for carbon emission:-

- Transportation
- Electricity purchased from Distribution companies.

11.4.1 Carbon Emission by Transportation

Principal, Administrator , teaching & non-teaching staff and students comes to college either by two wheelers & four wheelers . The two major fuels used by the transport sector are petrol and diesel. These fuels are carbon intensive as they contain 80-85% of carbon by weight.

Sl. No.	Fuel Used	Types of Transport	Persons	Numbers of Persons	A	B	C	D= C/B	E	F=E x D	G	H=G x F x A
					Nos. of Vehicle Used	mileage	Av. distance in KM	Fuel Consumed per Day per Vehicle in ltr	Total working days	Petrol Consumption Per Vehicle in a year	Emission factor	Total emission
1	**No Fuel**	**Bicycle**	Students	2500	2500							
			Non Teaching Staff	13	13							
2	Petrol	Two Wheeler	Students	600	500	40	20	0.5	176	88	2.67	140976
			Non Teaching Staff	75	75	40	30	0.75	176	132	2.67	26433
			Teaching Staff	40	40	40	20	0.5	176	88	2.67	9398
3	Petrol	Four Wheeler	Teaching Staff	65	65	15	20	1.33	176	234.1	2.67	40628
4	Diesel	Auto	Students	900	225	25	30	1.2	176	211.2	2.67	507514
		Bus	Students	860	50	6	40	6.67	176	1174	2.67	2695739
			Teaching Staff	5	2	6	60	10	176	1760	2.67	23496
Total Co2 emission in KgCo2 eq per Year												**3444184**

Table 29: Carbon emission by transport

Thus, total emission by the transport is 2,37.559 KG CO_2 eq. Per year

11.4.2 Carbon Emission by Electricity

Electricity is taken by grid which uses coal for generating electricity or DG set which uses diesel for electricity generation.

Parameter	Emission Factor (A)	Unit in KWH (B)	Total emission (C= A x B)
Grid Electricity	0.82	159256	130590
Total $KgCO_{2Eq.}$ Emission by Electricity			**130590**

Table 30: Carbon Emission by Electricity

Thus, total emission by purchased electricity is 1,30,590 $KgCO_{2Eq.}$

Total Carbon dioxide emission at Govt. VYT PG Autonomous College , Durg

Area	CO2 eq. emission in KG
Electricity	130,590
Transport	3444184
Total	**3,574,774**

Table 31 : Total Carbon dioxide emission at Govt. VYT PG Autonomous College

11.5 Reduction of Carbon Emission

B) The following installation /activity is responsible for reduction in carbon emission:-

- Off grid Solar Power Plant of 10 KW Capacity
- Composting
- Tree plantation

11.5.1 Reduction of Carbon Emission by Solar Power Plant

The solar power plant has generated 63,622 unit from renewable sources in the year 2019-2020 . If it is not generated from solar then it would be purchased from electricity distribution companies which will produced from burning of coals in thermal power plant, which causes carbon dioxide emission.

Parameter	Emission Factor	Unit in KWH	Total reduction of emission
Solar Power Plant	0.82	4325	3547

Table 32 Reduction of Carbon Emission by Solar Power Plant

Thus, solar power plant has reduced 19,680 KG of CO_2eq. Per year.

11.5.2 Reduction of Carbon Emission due to absorption of CO_2 by Tree Plantation

Planting is a great way to help sequester carbon emissions. Through photosynthesis ***trees absorb carbon dioxide to produce oxygen, food and wood***.

Particulars of Flora	Numbers	Carbon absorption by one tree Per year	Total Carbon Di Oxide in Kg
Full grown Tree	675	6.8	4590
Semi Grown Tree	250	3.4	850
Quarter grown plants	128	1.7	218
Total Carbon dioxide absorption by trees			5658

Table 33 : Carbon absorption by tree plantation.

11.5.3 Total Reduction in Carbon dioxide emission at Govt. VYT PG Autonomous College, Durg Campus

Area	Reduction in CO2 eq. emission in KG
Solar	3547
Trees	5658
Total	**9205**

Table 34 : Total Reduction in Carbon dioxide emission

12. RECOMMENDATIONS

12.1 Formation of ENCON Club:

We recommend to formation of the ENCON Club in Govt. VYT PG Autonomous College Durg for spreading awareness on the importance of energy conservation. ENCON Club will participate in all energy conservation activities and organize program with the support of Chhattisgarh State Renewable Energy Development Agency, (CREDA) Raipur and Bureau of Energy Efficiency,(BEE) New Delhi.

Every year, India observes National Energy Conservation on December 14. The day is organized by the Bureau of Energy Efficiency (BEE) – which operates under the Ministry of Power, aiming to present India's stellar achievements in cost-efficient energy production and resource conservation.

ENCON Club will celebrate "Energy Conservation Day" on 14Th December, each year. Further plans for the future may be discussed on this day, targeting holistic development as the main goal towards mitigation of climate change. It would not only help in imparting knowledge on energy efficiency but also in its implementation in households and institutions.

Objective of ENCON Club

The objective of the club is to create awareness among the students, staff and teachers and equip them for efficient management of all forms of energy, to promote energy efficiency and energy conservation. The club will keen to spread "Energy Conservation Messages" in the society by conducting awareness programmes to students and public.

12.2Replacement of all conventional tube light will replaced by energy efficient LED tube light:

Govt. VYT PG Autonomous College, Durg is replacing conventional tube light with LED light fittings. However, still 671 numbers of conventional tube lights are remain to be replaced. Replacement of tube light by energy efficient LED tube light will not only saves electricity consumption but also saves CO_2 emission directly and indirectly.

Wattage of conventional Tube light including choke	50
Wattage of LED tube light	22
Saving in wattage	28
Quantity	671
Saving in connectd load in KW	18.788
Average Operating hours	7
No. of days in operation	210
Annual saving in unit consumption	27618
Energy Cost in Rs. Per unit	7.5
Total annual monitory saving in Rs.	207135
Price of one LED 22 Watt tube light	350
Total Investment	234850
Simple Payback period	14 months

Table 35 : Replacement of all conventional tube light will replaced by energy efficient LED tube light

The total investment is about Rs. 2,07,135 and simple payback period is about 14 months

12.3Replacement of all conventional fans by 28 watt energy efficient fans.

In college, conventional fans are installed. We have recommended to use Energy Efficient Fan in college building. All 1435 conventional fans (70 W) shall be replaced by 28 watt energy efficient fans. The total saving of this energy conservation measure is about 6.37 lakh per annum and total investment is about 45.92 lakh. The simple payback period is 87 months.

Wattage of conventional fan	75
Wattage of Energy Efficient Gorilla Fan	28
Saving in wattage	47
Quantity	1435
Operating hours	6
No. of days in operation	210
Annual saving in unit consumption	84981
Energy Cost in Rs. Per unit	7.5
Total annual monitory saving in Rs.	6,37,358
Price of one LED 22 Watt tube light	3200
Total Investment	45,92,000
Simple Payback period	87 months

Table 36 : Replacement of all conventional fans by 28 watt energy efficient fans

Technical Description

Energy Efficient Gorilla Fan/ Super fan

Every energy efficient Gorilla/Super fan uses BLDC (Brushless Direct Current) motor. BLDC motor has no mechanical brush for commutation of the windings. Commutation is deployed with the help of smart electronics. As a result the fan runs internally at 24V and consumes just 28 W at full speed.

Key features of BLDC design:

- Extremely low heat & associated power loss
- Better flexibility over controlling motor speed
- Smart motor tuning algorithm
- No spark and minimal electrical noise
- Sensor less design
- A BLDC fan takes in AC voltage and internally converts it into DC using SMPS.
- The main difference between BLDC and ordinary DC fans is the commutation method. A commutation is basically the technique of changing the direction of current in the motor for the rotational movement. In a BLDC motor, as there are no brushes so the commutation is done by the driving algorithm in the Electronics. The main advantage is that over a period of time, due to mechanical contact in a brushed motor the commutators can undergo wear and tear, this thing is eliminated in BLDC Motor making the motor more rugged for long-term use.

Figure 8 : BLDC motor of Energy Efficient fan

- To explain, BLDC technology in simpler terms, BLDC uses a combination of Permanent Magnets and Electronics to achieve the kind of efficiency and performance it delivers. A BLDC fan composes of 3 main components:
- 1.Stator
  2.Rotor
  3. Electronics.

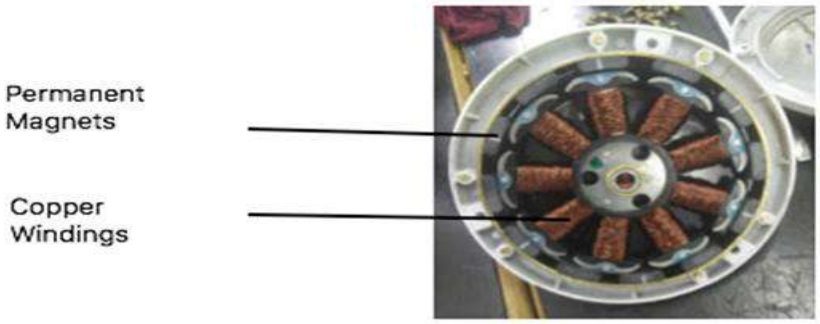


Figure 16: Inside view of BLDC motor

- The electronics contains a driving algorithm which drives the BLDC motor. As discussed earlier in a BLDC motor the position of magnets in the fan is sensed by electronics that either uses a Hall effect sensor or back EMF. Modern BLDC motors use Back EMF for commutation due to proven disadvantages of hall effect sensor over period of time.
- To explain it in easier terms, we can take an example of a donkey who has a carrot fixed over his head as per shown in the picture below:
- Consider the Stator to be the Carrot and the donkey to be the Magnets. The polarity of the stator will keep changing, due to attraction the

magnets will create rotational moment, just like how the donkey tries hard to reach the carrot in the picture.

- Permanent magnets used in rotor are responsible for mass reduction in power consumption compared to windings used in the stator in an ordinary induction fan. One added advantage in a BLDC fans due to use of an electronic circuit is that you can add several additional features to increase convenience, few example of the same are sleep mode, timer mode also it is compatible with Home automation systems. Most of the BLDC Ceiling fans are operated by remote unlike traditional regulator reducing the purchase cost of regulator.
- Compared to regular induction fan, a BLDC fan can save up to Rs 1000-1500/ Year/fan. And because there is no heating of the motor, the life of a BLDC fan is also expected to be much higher than ordinary fans.

12.4Dust cleaning on Solar Photo Voltaic Modules Surface

The degree of efficiency deterioration depends on the specific mass and Size of dust particles deposition on PV module surface. As the mass of dust deposition increases, power output and the efficiency of the module decrease, and as the size becomes smaller, power output decreases as smaller particles block more radiation on PV module surface. The different pollutant depositions may include red soil, ash, sand, calcium carbonate, silica, etc. The presence of air pollution may significantly deteriorate the energy yield of PV panels; even after a short period of the panels' outdoor exposure

(e.g., 2 months) without cleaning, it may cause a decrement of 6.5% in energy production approximately

12.5 Installation of Grid connected Solar Roof top system on the roof top of college

Solar Roof Top Grid Connected Solar Power Plant

In a solar rooftop system, the solar panels are installed in the roof of any residential, institutional, social, Government, commercial, industrial buildings etc. This can be of two types

a) Solar Rooftop System with storage facility using battery,

b) Grid Connected Solar Rooftop System.

In grid connected rooftop or small SPV system, the DC power generated from SPV panel is converted to AC power using power conditioning unit/Inverter and is fed to the grid either of 440/220 Volt three/single phase line or of 33 kV/11 kV three phase lines depending on the capacity of the system installed at residential, institution/commercial establishment and the regulatory framework specified for respective States. These systems generate power during the day time which is utilized by powering captive loads and feed excess power to the grid as long as grid is available. In case, where solar power is not sufficient due to cloud cover etc., the captive loads are served by drawing balance power from the grid.

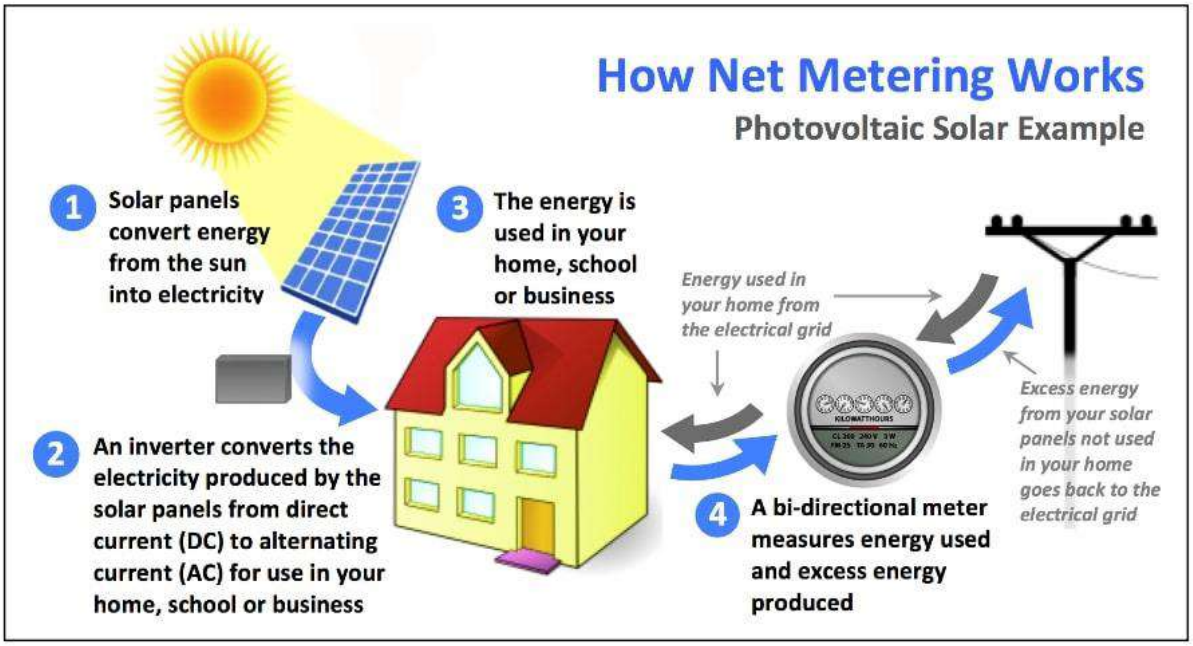


Figure 9 : How Net Metering works

Main components of Solar rooftop system

- Solar PV Modules/Solar Panels – The Solar PV modules/Solar Panels convert solar energy to electrical energy. They are available in different technologies such as crystalline, thin film, CIGS, CdTe, HIT, etc. Crystalline Solar PV panels are most common in use on roof tops.
- Inverter – Inverter converts DC output of Solar PV panels into AC power.
- Mounting structure – The mounting structure, is the support structure that holds the Solar PV panels
- Balance of System – These consist of cables, switchboards, junction boxes, meters, structures, tracking system (if required), earthing system ,circuit breaker, fuses etc.

Models for implementation of Rooftop PV systems

CAPEX Model : Here, the entire system is owned by the rooftop owners and he bears the cost of the Soalr system. Responsibility of O&M for the system lifetime (25 years) is also with the rooftop owner. Developer is responsible for installing the system and initial 2 years O&M and five years warranty.

RESCO Model : Here, the entire system is owned by the developer. Responsibility of O&M for the system lifetime (say about 25 years) is also with the developer. Rooftop owners may consume the electricity generated, for which they have to pay a pre-decided tariff on a monthly basis. Excess generation may be exported to the grid, subject to availability of requisite state regulations.

For consumers that have adequate manpower/expertise for O&M, rooftop access concerns, availability of funds upfront, CAPEX model is better. Consumers in states that have net metering regulations can take benefit of the same in case they have substantial excess generation.

On the other hand, consumers who prefer not to take responsibility for the system O&M, do not have rooftop security concerns and prefer to pay on a monthly basis rather than bulk upfront payment may choose to go for RESCO model.

Net Metering

The grid connected rooftop system can work on net metering basis wherein the beneficiary pays to the utility on net meter reading basis only. Alternatively two meters can also be installed to measure the export and import of power separately. The mechanism based on gross metering at mutually agreed tariff can also be adopted.

Figure 10 : A Solar roof top system

We are recommending 50 KW of grid connected solar power plant.

12.6 Enhancement of Energy Efficacy of light fittings:

Cleaning of tube-lights/bulbs to be done periodically, to remove dust over It. It affects on lamp efficacy (lm/watt).

12.1 General Recommendation for Energy Saving in Office Equipment

Equipment	Wattage	Comments
CRT Monitor	100 - 120W (during operating condition)	CRT monitors consume a lot of power, much of which is wasted as heat, and represent the largest power consumption component in a typical desktop computer. Emit potentially harmful radiation. Fortunately, most CRT monitors these days are legacy equipment as new computers are generally supplied with LCD monitors. Unfortunately, most CRT monitors end up in landfill.
Desktop Computer	150W (during operating condition)	Power consumption will differ significantly depending on whether a CRT or LCD monitor is used. In home and office situations where it is necessary to run multiple desktop computers, it may be possible to make significant power savings by running a single terminal server computer with several LCD monitors and keyboards attached. Terminal server computers can also greatly simplify network management, software upgrades, etc
Photo copier	7-30W (Sl. Mode) 40-300W (Standby) 200-1300W (op. condition)	Most of the energy used in a photocopier is consumed by the hot rollers, which are usually kept hot on stand-bay, consuming from 40-300W. Significant energy savings (40% to 60%) can be made by ensuring that photocopiers are switched off at night and on weekends. Some photocopiers consume up to 30 watts even when switched off, so photo copiers should be switched off at the power outlet to ensure they are really "off".
LCD Monitor	30-50W (during operating condition)	LCD monitors typically require about 30% of the power required for a CRT monitor with the same screen area. In addition, the amount of heat generated by an LCD monitor is considerably less than a CRT monitor, resulting in a lower load on ACs. Building cooling needs may be decreased by up to 20%.

Inkjet Printer	120W (during operating condition)	Inkjet printers use relatively little power in comparison to laser printers. From an energy consumption point of view, inkjets are preferable to lasers. Unfortunately, they typically cost more to un on a cost -Per -print basis and sometimes produce less than optimum results
Laser Printer	25-80W (Standby) 150-1100W (during operating condition)	Laser printers consume significant amounts of power even when in standby mode. Over the course of an 8 -10 hr working day, a laser printer could consume around 1kWh of energy. On the other hand, laser printers are cheaper to run on a cost-per page basis and generally produce better results. Both the number of laser printers used, and the number of hours the are operated for, should be minimized. As with printing of any kind, office procedures should be developed which minimize the need for printing to paper
Laptop Computer	15-40 W (during operating condition)	Laptop computer power consumption is typically 10% to 25% of that of a desktop computer. In situations such as an office or home office, where computers may operate for 8 to 10 hours a day, this difference is significant and could represent an energy saving of up to 1kWh per day.

Table 37 : General Recommendation for Energy Saving in Office Equipment