ISO 50001:2018

Certificate of Registration

This is to Certify that

Energy Management System of

DVR & Dr.HS

MIC COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

KANCHIKACHERLA - 521180, N.T.R. DIST, A.P, INDIA.

has been assessed and found to conform to the requirements of

ISO 50001:2018

for the following scope :

Providing Educational Services leading to the Award of Diploma Programmes in Engineering, Under Graduate Programmes in Engineering (B.Tech), Post Graduate Programmes in Engineering (M.Tech), Master of Computer Applications (MCA) and Master of Business Administration (MBA).

Certificate No	: **23EEnLX17**		
Initial Registration Date	: 30/06/2023	Issuance Date	: 30/06/2023
Date of Expiry	: 29/06/2026		
1st Surv. Due	: 30/05/2024	2nd Surv. Due	: 30/05/2025

Director

EGAC Accredited
EnMS Certification
CAB # 012226

PRINCIPAL
DVR & Dr. HS MIC College of Techn
Kanchikacherla, N.T.R. Dt.
Andhra Pradesh, India – Pin: 521...

AQC GLOBAL LLC

Head Office: Office No. 02, Ground Floor, Sharjah Media City, Sharjah, UAE. e-mail: info@aqcworld.com.

Key Location: A-60, Sector - 2, Noida, Uttar Pradesh, 201301, India.

**Validity of the Certificate is subject to successful completion of surveillance audit on or before of due date. (in case surveillance audit is not allowed to be conducted, this certificate shall be suspended/withdrawal).*

Certificate Verification: Please Re-check the validity of certificate at http://www.aqcworld.com/activeclients.aspx or www.aqcworld.com at Active Clients. Certificate is the property of AQC Global LLC and shall be returned immediately when demanded

ENERGY AUDIT REPORT

(2018-2019)

SAVE ENERGY SAVE EARTH

Devineni Venkata Ramana & Dr.Hima Sekhar
MIC College of Technology
(Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada)
Kanchikacherla - 521180, Krishna Dist, A.P. India.
Phone : 08678 - 273535, 273623, Fax: 08678 - 273569
e mail: dvrhsmic@mictech.ac.in, Website: www.mictech.ac.in

AUTONOMOUS
NBA-Accredited B.Tech (CSE|ECE|ME)
Accredited by NAAC With Grade A

Devineni Venkata Ramana & Dr.Hima Sekhar
MIC College of Technology
(Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada)
Kanchikacherla - 521180, Krishna Dist, A.P. India.
Phone : 08678 - 273535, 273623, Fax: 08678 - 273569
e mail: dvrhsmic@mictech.ac.in, Website: www.mictech.ac.in

AUTONOMOUS
NBA-Accredited B.Tech (CSE|ECE|ME)
Accredited by NAAC With Grade A

IOC – Outgoing
DEPARTMENT: EAC
ACADEMIC YEAR: 2018-2019

QMS – F 061
DATE:10-05-2019
SEMESTER: I & II

Originator	PRINCIPAL
Circulated To	ALL HODs, Office, Library In charge, COE

CIRCULAR

This is to inform that Energy audit is scheduled on **15-05-2019 to 16-05-2019** ie Wednesday & Thursday. In this regard , all the HODs and department EAC coordinators are hereby informed to keep the necessary documents(related to A.Y 2018-19 Semister-I & II) updated and ready for smooth conduct of audit.

(Dr.Y.Sudheer Babu)
Principal

CC to : CEO for information

PRINCIPAL
Devineni Venkata Ramana & Dr. Himasekhar
MIC College of Technology
Kanchikacherla, Krishna District

DVR & Dr. HS MIC COLLEGE OF TECHNOLOGY
Kanchikacherla
Pin : 521180
Ph.273535

ENERGY AUDIT COMMITTEE MEMBERS

Sl. No.	Name of the Staff Member	Designation	Signature
1	Dr. Y. Sudheer Babu Principal	Chairman	
2	Dr. T. Vamsee Kiran HOD, EEE	Convener	
3	Mr. R. V. Ranjith Kumar Assistant Professor, ME	Member	
4	Mr. K. Prasad Assistant Professor, C.E	Member	
5	Mr. P.N.V Kishore Assistant Professor, B.E.D	Member	
6	A.V. Ravi kumar Assistant Professor, EEE	Member	
7	Mrs. V. Lakshmi Chethana Assistant Profess , CSE	Member	V.L.Chethana
8	Mr. K. Veenanand Assistant Professor, ECE	Member	
9	Mr. S. Vamsi krishna Electrical Maintenance	Member	Vamsi

Table of Contents

		Exide power safe Plus-4 Each battery 12V,65AH
4	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
5	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
6	20kVA, APC	32 Batteries, Rocket, Each battery 12V,42AH
7	3kVA , APC	6 Batteries, Excide Power Safe Plus. Each battery 12V,26AH
8	10kVA,APC	16 Batteries, Excide Power safe Plus .12V,26AH
9	3kVA,APC	6 Batteries, AMARON 12V,32AH
10	20kVA, Numaric	16 Batteries, AMARON, Each battery 12V, 65AH. 15 Batteries, Excide Power safe Plus .Each Battery 12V,26AH
11	20kVA, APC	32 Batteries, AMARON, Each battery 12V,42AH

b. Diesel generators

The Institute has 2 Diesel Generators with a rating of 200 KVA & 125 KVA with Automatic Changeover for Uninterrupted Supply.
The generator is frequently serviced and well maintained by the maintenance team for efficient working.

1.Introduction:

Energy audit is the verification, monitoring, and analysis of how energy is used, including the submission of a technical report with recommendations for increasing energy efficiency with a cost-benefit analysis and an action plan to reduce energy consumption.

A systematic study or survey to identify how energy is being used in a building or plant, and identify energy savings opportunities is done and reducing energy usage by using appropriate audit techniques and an action plan is proposed in this report.

The main Objectives of an Energy Audit are:

i). Review of energy saving opportunities and measures implemented in the audit sites and identification of additional various energy conservation measures and saving opportunities.

ii). Implementation of alternative energy resources for energy saving opportunities and decision making in the field of energy management.

iii). Providing a technical information on how to build an energy balance as well as guidance to be sought for particular applications.

iv). Detailed analysis on the calculation of energy consumption, analysis of latest electricity bill of the campus

v). Use of incandescent (tungsten) bulb and CFL bulbs, fans, air conditioners, cooling apparatus, heaters, computers, photo copiers, inverter, generators and laboratory equipment and instruments installed in the organization

vi). Creating awareness among the stakeholders on energy conservation and utilization.

2. About the college:

MIC Odyssey began in 2002 in Kanchikacherla, a village that boasts of idyllic beauty and serene atmosphere suited for scholastic pursuits. Right from its inception, the College has crossed new vistas making inroads into Quality Education under the dynamic stewardship of our Visionary Chairman Dr. MV Ramana Rao, M.E., Ph.D., CEO & MD MIC Electronics Ltd., Hyderabad.

MIC's tryst with destiny began in 2002 with three branches of B.Tech., (ECE, CSE, and EEE). In 2004, the Mechanical Engineering branch in B. Tech., MCA & MBA courses were added. The College was granted permission to run M.Tech., in Machine Design, PE&D, VLSI&ES, and CSE in 2012. APSCHE approved diploma courses in 2012-13 with two branches: EEE and ME. In 2013-14, two more branches in diploma viz., CE and ECE were approved. In 2013, permission was accorded for B. Tech., in the Civil Engineering branch and 2017, for B.Tech., in Information Technology.

The College was approved by the All India Council for Technical Education (AICTE), New Delhi, and is permanently affiliated with the JNTUK, Kakinada .

3. Sources of energy:

The major sources of energy for the college include

Electrical grid power supply connection

The institute have a Three Phase, 11 KV/433 V, 50 HZ distribution transformer supplied by APSPDCL.This is frequently serviced and well maintained for efficient and uninterrupted supply.

This transformer is installed in an isolated area inside the campus and is fully fenced for safety and protection.

4. Power Backup:

Institute has the facility of power backup system in case of failure of electricity. The power backup system include

a. UPS and battery banks

UPS & Battery Banks are provided in all the Computer labs, Library, Exam cell etc.

Generator facility is provided to each and every corner of the college which includes Laboratories, Class rooms, Library, Canteen, Hostel etc.

UPS & Battery bank details:

S.No	UPS Capacity & Make	No of Batteries, Make & Capacity
1	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
2	20kVA, APC	32+4 Batteries, AMARON(32), Excide(4) , Each battery 12V,65AH
3	20kVA, APC	32 Batteries, AMARON-28,


JAKSON

5.Energy consumption:

The power requirement of various electrical devices in the institute is as follows

Table 5.1

BLOCK NAME	BLOCK I (MAIN BLOCK-GROUND FLOOR)	BLOCK II (MAIN BLOCK-FIRST FLOOR)	BLOCK III (MAIN BLOCK-SECOND FLOOR)	BLOCK IV (BED Dept. ,MECH LABS)	BLOCK V (GIRLS HOSTEL)	BLOCK VI (BOYS HOSTEL , CANTEEN&AUDITORIUM)	OTHERS	TOTAL	Power Rating (W)	Power consumption (W)
LIGHT TUBE	241	173	191	348	274	76	9	**1312**	40	52480
LIGHT CFL	0	0	6	0	1	0	1	**8**	25	200
LIGHT LED	178	214	108	78	2	155	56	**791**	15	11865
FAN - CEILING	104	143	97	138	137	110	0	**729**	80	58320
FAN - EXHAUST	4	8	3	4	18	6	0	**43**	25	1075
UPS	2	6	1	1	1	1	0	**12**	800	9600
AC 1.5T	5	21	2	2	0	20	0	**50**	1700	85000
AC 2T	8	3	3	4	0	0	0	**18**	2000	36000
COMPUTERS	405	128	130	140	1	1	0	**805**	300	241500
PRINTERS	4	12	1	1	0	0	0	**18**	50	900
PROJECTORS	6	4	1	1	0	1	0	**13**	150	1950
WATER COOLERS	2	1	3	2	1	2	0	**11**	100	1100
Immersion water heaters					12	12	0	**24**	1000	24000
						TOTAL POWER COSUMPTION				**523990**

Table 5.1 shows the power consumption of various major electrical devices in the campus. The complete campus is divided into six blocks and the area other than these six blocks is shown as others in the table.

6.Energy conservation measures:

Existing power saving methods:

1. Turn off electrical appliances when not in use.
2. water heaters are installed on the Girls and Boys hostel.
3. Power factor improvement devices are installed in the campus.
4. Common switch for each floor.

Energy saving methods to be implemented:

The following energy saving methods may be implemented in the campus.

1. Replace the Fluorescent Tube Lights (FTL) with LED Tube Lights.

The 40 W FTLs can be replaced with the LED tube lights 20 W. These changes can be made at the places where the usage is higher. Usually minimum of 1 year warranty is given and approximate burning hours is 40,000. (15 years considering 6 hours per day running).

Following calculations are done for 6 hours working:

- Power consumption by 36 W FTL with conventional choke = **40 W/ Tube Light.**
- Equivalent LED tube light = **20 W/ Tube Light.**
- Savings in power = **20 W/ Tube Light.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of FTL over an year = 40 W × 1800 h/year = **72 kWh/year/Tube Light**
- Total power usage of LED Tube light over an year = 20 W × 1800 h/year = **36 kWh/year/Tube Light**
- Tube Light Yearly savings = 1,800 x 20W = **36 kWh/year/Tube Light.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 36 kWh x 7.65 = **Rs. 275.4 / year / Tube light.**
- Approximate investment on single LED Tube lights = **Rs. 219** (Panasonic LED 20W Batten, 1 pc).
- Number of Tube Lights to be replaced = **1312**
- Electrical Energy Saved = 36 kWh x 1312 = **47232kWh / year.**

Summary:

Total Investment =1312x Rs.219 = **Rs. 2,87,328/-**

Total Yearly Saving = 1312 x 275.4 =**Rs. 3,61,325 / year**

Payback:

(2,87,328/3,61,325) = 0.79 years = **around 9.5 months**

2. Replace the CFL Lights with LED Lights.

The 25 W CFL lights can be replaced with the LED lights of 10 W. These changes can be made at the places where the required intensity of lighting is low.

Following calculations are done for 6 hours working:

- Power consumption by CFL lights = **25 W/ Light.**
- Equivalent LED light = 1**0 W/ Light.**
- Savings in power = **15 W/ Light.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of CFL lights over an year = 25 W × 1800 h/year = **45 kWh/year/Light**
- Total power usage of LED light over an year = 10 W × 1800 h/year = **18 kWh/year/Light**
- Tube Light Yearly savings = 1,800 x 20W = **27 kWh/year/Light.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 27 kWh x 7.65 = **Rs. 206.55 / year / Light.**
- Approximate investment on single LED lights = **Rs. 212** (Eveready LED 10W Bulb, 1 pc).
- Number of Tube Lights to be replaced = **8**
- Electrical Energy Saved = 27 kWh x 8 = **216 kWh / year.**

Summary:

Total Investment =8 x Rs.212 = **Rs. 1,693/-**

Total Yearly Saving = 8 x 206.55 =**Rs. 1652.4 / year**

Payback: (1693/1652.4) = 1.02 years = **around 13 months**

7.RECOMMENDATIONS/ SUGGESTIONS:

For Improving Energy Consumption:

- Every classroom and lab with central switch board can have a diagram linking location of a tube light, fan etc. with corresponding switch. This will ensure that correct fitting is switched on/ off and can save time & unnecessary operation.
- Conduct energy audit every year and determine the lux levels within College. Energy audit can help in reduction in number of light fittings/ energy usage in the College.
- For purchasing new electronic appliances, star rating provided by Bureau of Energy Efficiency (BEE) should be considered. The equipment which has maximum star ratings could be purchased, which will consume less energy, ensure environmental sustainability and also operate at low cost.
- Usage of light reflectors is recommended as the reflectors can spread light to relatively large areas. Notices/ signages can be put up/ displayed near switches and on notice boards, informing students and staff to switch off all electricals when not in use.
- If possible, computers should be switched off from main power connections.
- Control sensors can help to reduce consumption by automatically dimming lights when people are not around, and keeping blinds open to use natural light & reduce energy consumption.
- **Raise awareness**: Encourage students to help in monitoring energy consumption & implement corrective actions, Integrate energy education into classroom learning
- **Housekeeping:**

  Curtains – Always keep curtains closed on windows to prevent direct sunlight inside the room to avoid heating of cooled air. This reduces A.C. load significantly.
- **Better Practices for A.C.:**

  The institute has both split and window type A.C.s which makes a very large part of total energy consumption of the campus. But at many places it was found that AC is not used with best recommended practices. Even simple things such as insulation, damaged windows, poor insulation curtains, etc can effect the power consumption.

Summarized below are some guidelines for most efficient use if A.C.s:

1. **Proper insulation** – Good quality insulation must be maintained in the air-conditioned rooms by keeping all doors and windows closed properly so as to prevent cool air go out and hot air come in.
   Replacing life expired inefficient AC units with energy efficient 5 star rated AC units
2. **Operating** – The A.C. should be switched on 15 minutes before actual use and should be switched off before leaving the room.

- **Pumps**
  1. Operate pumping near best efficiency point.
  2. Adapt to wide load variation with variable speed drives or sequenced control of smaller offices.
  3. Stop running both pumps -- add an auto-start for an on-line spare or add a
  4. Use booster pumps for small loads requiring higher pressures.
  5. Repair seals and packing to minimize water waste.
- **Motors**
  1. Properly size to the load for optimum efficiency.
  2. Provide proper ventilation
     (For every 10°C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved)
  3. Check for under-voltage and over-voltage conditions.
  4. Demand efficiency restoration after motor rewinding.

- All Class Rooms and labs to have Display Messages regarding optimum use of electrical appliances in the room like lights, fans, computers and projectors. Save electricity. Display the stickers of save electricity, save nature everywhere in the campus. So that all stakeholders encouraged to save the electricity.
- Use **motion sensor** in corridors, passage, library, class rooms and toilets.

- Most of the time, all the tube lights in a class room are kept ON, even though, there is sufficient light level near the window opening. In such cases, the light row near the window may be kept OFF.
- All projectors to be kept OFF or in idle mode if there will be no presentation slides. All computers to have power saving settings to turn off monitors and hard discs, say after10 minutes/30 minutes.
- Lights in toilet area may be kept OFF during daytime.
- Use Automatic Power Factor Correction (APFC) Panel for PF improvement.
- Need to replace ordinary refrigerator by BEE power saver refrigerator if possible.

COMPUTERS

- Configure your monitor to turn off after 10 minutes of inactivity, your hardware to turn off 20 minutes after your inactivity. Place your PC in a standby mode when you leave office for more than 2hrs.
- Do not use screensaver as energy saver as they cause monitor to continue operating at full power.
- Use sleep-mode when not in use helps cut energy costs by approx 40%.
- There is a common misconception that pc's and monitors purchased with energy star logo are efficient, in reality they are built in energy conservation features but PC can't take full advantage of it.

USE OF MASTER SWITCH ON EACH FLOOR

- Installation of master switch can make it easy for a person to switch off all appliances of a room in case someone forgets to switch off while leaving the room.

UPS SYSTEMS

- Optimizing the number of ups by disconnecting additional ups and improving load and existing working ups.

➢ Recommended to Install Solar PV system

DVR & Dr. HS MIC COLLEGE OF TECHNOLOGY Kanchikacherla Pin : 521180 Ph.273535

PRINCIPAL
Devineni Venkata Ramana & Dr. Himasekhar
MIC College of Technology
Kanchikacherla, Krishna District

ENERGY AUDIT REPORT

(2019-2020)

SAVE ENERGY SAVE EARTH

Devineni Venkata Ramana & Dr.Hima Sekhar
MIC College of Technology
(Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada)
Kanchikacherla - 521180, Krishna Dist, A.P. India.
Phone : 08678 - 273535, 273623, Fax: 08678 - 273569
e mail: dvrhsmic@mictech.ac.in, Website: www.mictech.ac.in

AUTONOMOUS
NBA-Accredited
B.Tech (CSE|ECE|ME)
Accredited by NAAC With Grade A

Devineni Venkata Ramana & Dr.Hima Sekhar
MIC College of Technology
(Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada)
Kanchikacherla - 521180, Krishna Dist, A.P, India.
Phone : 08678 - 273535, 273623, Fax: 08678 - 273569
e mail: dvrhsmic@mictech.ac.in, Website: www.mictech.ac.in

AUTONOMOUS
NBA-Accredited B.Tech (CSE|ECE|ME)
Accredited by NAAC With Grade A

IOC – Outgoing
DEPARTMENT: EAC
ACADEMIC YEAR:2019-20

QMS – F 061
DATE:11-05-2020
SEMESTER: II

Originator	PRINCIPAL
Circulated To	ALL HODs, Office, Library In charge, COE

CIRCULAR

This is to inform that Energy audit is scheduled on **18-05-2020 to 19-05-2020** ie Monday & Tuesday. In this regard , all the HODs and department EAC coordinators are hereby informed to keep the necessary documents(related to A.Y 2019-20 Semister-I & II) updated and ready for smooth conduct of audit.

(Dr.Y.Sudheer Babu)
Principal

CC to : CEO for information

PRINCIPAL
Devineni Venkata Ramana & Dr Himasekhar
MIC College of Technology
Kanchikacherla, Krishna District

DVR & Dr. HS MIC COLLEGE OF TECHNOLOGY
Kanchikacherla
Pin : 521180
Ph.273535

ENERGY AUDIT COMMITTEE MEMBERS

Sl.No.	Name of the Staff Member	Designation	Signature
1	Dr. Y. Sudheer Babu Principal	Chairman	
2	Mr. P. Pradeep Associate Professor, EEE	Convener	
3	Mr. R. V. Ranjith Kumar Assistant Professor, ME	Member	
4	Mr. K. Prasad Assistant Professor, C.E	Member	
5	Mr. P.N.V Kishore Assistant Professor, B.E.D	Member	
6	A.V. Ravi kumar Assistant Professor, EEE	Member	
7	Mrs. V. Lakshmi Chethana Assistant Professor, CSE	Member	
8	Mr. K. Veenanand Assistant Professor, ECE	Member	
9	Mr. S. Vamsi krishna Electrical Maintenance	Member	

Table of Contents

1.Introduction:

Energy audit is the verification, monitoring, and analysis of how energy is used, including the submission of a technical report with recommendations for increasing energy efficiency with a cost-benefit analysis and an action plan to reduce energy consumption.

A systematic study or survey to identify how energy is being used in a building or plant, and identify energy savings opportunities is done and reducing energy usage by using appropriate audit techniques and an action plan is proposed in this report.

The main Objectives of an Energy Audit are:

i). Review of energy saving opportunities and measures implemented in the audit sites and identification of additional various energy conservation measures and saving opportunities.

ii). Implementation of alternative energy resources for energy saving opportunities and decision making in the field of energy management.

iii). Providing a technical information on how to build an energy balance as well as guidance to be sought for particular applications.

iv). Detailed analysis on the calculation of energy consumption, analysis of latest electricity bill of the campus

v). Use of incandescent (tungsten) bulb and CFL bulbs, fans, air conditioners, cooling apparatus, heaters, computers, photo copiers, inverter, generators and laboratory equipment and instruments installed in the organization

vi). Creating awareness among the stakeholders on energy conservation and utilization.

2. About the college:

MIC Odyssey began in 2002 in Kanchikacherla, a village that boasts of idyllic beauty and serene atmosphere suited for scholastic pursuits. Right from its inception, the College has crossed new vistas making inroads into Quality Education under the dynamic stewardship of our Visionary Chairman Dr. MV Ramana Rao, M.E., Ph.D., CEO & MD MIC Electronics Ltd., Hyderabad.

MIC's tryst with destiny began in 2002 with three branches of B.Tech., (ECE, CSE, and EEE). In 2004, the Mechanical Engineering branch in B. Tech., MCA & MBA courses were added. The College was granted permission to run M.Tech., in Machine Design, PE&D, VLSI&ES, and CSE in 2012. APSCHE approved diploma courses in 2012-13 with two branches: EEE and ME. In 2013-14, two more branches in diploma viz., CE and ECE were approved. In 2013, permission was accorded for B. Tech., in the Civil Engineering branch and 2017, for B.Tech., in Information Technology.

The College was approved by the All India Council for Technical Education (AICTE), New Delhi, and is permanently affiliated with the JNTUK, Kakinada .

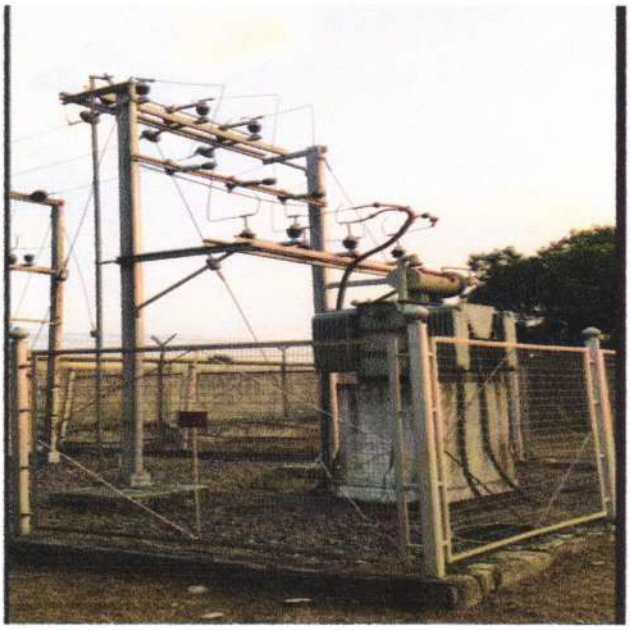
3. Sources of energy:

The major sources of energy for the college include

a. Electrical grid power supply connection

The institute have a Three Phase, 11 KV/433 V, 50 HZ distribution transformer supplied by APSPDCL.This is frequently serviced and well maintained for efficient and uninterrupted supply.

This transformer is installed in an isolated area inside the campus and is fully fenced for safety and protection.



b. 100 kWp On-Grid Roof Top Solar Power System

The institute also has **100 kWp On-Grid Roof Top Solar Power System.**

This project is installed under the Program of **New & Renewable Energy Development Corporation of Andhra Pradesh Ltd (NREDCAP)**. The total project cost is Rs. **50Lakhs**. Ministry of New and Renewable Energy (MNRE), Government of India, New Delhi provided a subsidy of 30%.

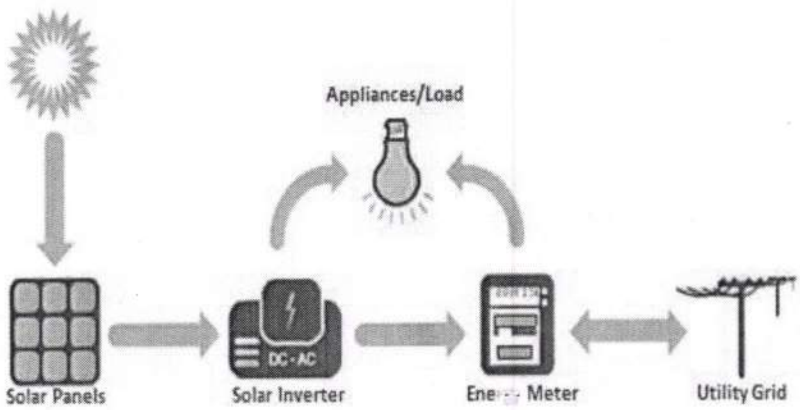
Harnessing the Solar has always been the one of its key drivers at DVR & Dr.HS MIC College of Technology in its Go Green initiatives with the installation of rooftop solar photovoltaic plant. In its pursuit to become energy efficient, DVR & Dr.HS MIC College of Technology, Kanchikacherla, Krishna Dist, Andhrapradesh formally commissioned a total of 100 kWp Solar PV Plant in the year of 2019.

System Specifications:

Total Installed Capacity	100 kWp
PV Modules	330Wp (304no's)
Cell Technology	Polycrystalline
Modules supplier	Green Secure Energy Pvt Ltd
Mounting	Fixed Tilt (45° South & North Facing)
Inverters rating	50KVA (2 no's)
Inverter Make	Polycab Company
Lightning Arresters	1
Earth Pits	4
Installed Year	2019

Description of Roof Top Solar System:

In grid connected rooftop or small solar photovoltaic (SPV) system, the DC power generated from solar panel is converted to AC power using power conditioning unit/Inverter and is fed to the grid.



Main components of a Grid Connected Rooftop Solar PV system:

Solar PV Modules/Solar Panels

Inverter

Module mounting structure

Bi-direction Meters

Balance of System

Solar PV Modules/Solar Panels – The Solar PV modules/Solar Panels convert solar energy to DC (direct current) electrical energy. They are available in different technologies such as crystalline silicon, thin film silicon, etc. Crystalline Silicon Solar PV panels are most commonly used in solar rooftop system. Multiple panels are connected together to form arrays as per the desired capacity of the system.

Inverter – Inverter converts variable DC output of Solar PV panels into AC power. Inverter also synchronizes with the grid so that generated power from the module can be injected into the grid.

Module mounting structure – The module mounting structure, is the support structure that holds the Solar PV panels in place for full system life and is exposed to all weather conditions. These are normally fixed at particular angle and orientation in case of solar rooftop system. But these can also be of type that tracks the Sun, called as trackers.

Bi-direction Meters – Meters are used to record the generation or consumption of electricity. Bi-direction is used to keep track of the electricity that solar PV system injects to utility grid and the electricity that is drawn from the utility grid.

Balance of System – These consist of cables, switchboards, junction boxes, earthling system, circuit breaker, fuses, lightning protection system, etc.

4. Power Backup:

Institute has the facility of power backup system in case of failure of electricity. The power backup system include

a. **UPS and battery banks**

UPS & Battery Banks are provided in all the Computer labs, Library, Exam cell etc.

Generator facility is provided to each and every corner of the college which includes Laboratories, Class rooms, Library, Canteen, Hostel etc.

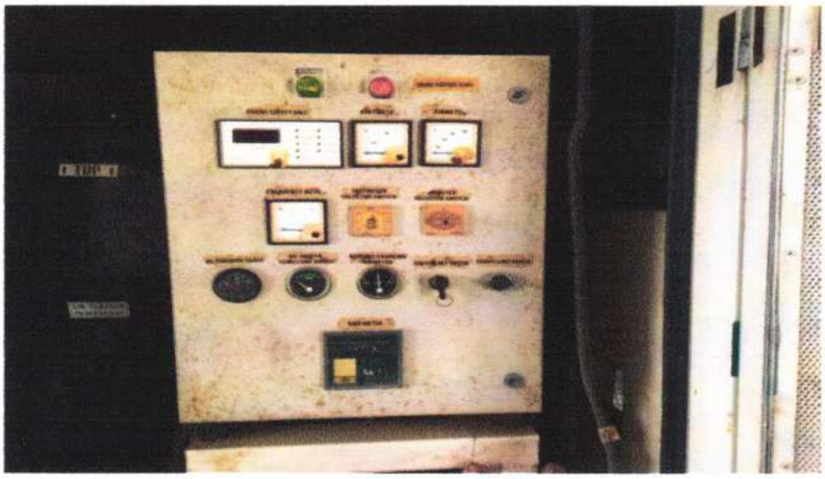
UPS & Battery bank details:

S.No	UPS Capacity & Make	No of Batteries, Make & Capacity
1	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
2	20kVA, APC	32+4 Batteries, AMARON(32), Excide(4) , Each battery 12V,65AH
3	20kVA, APC	32 Batteries, AMARON-28, Exide power safe Plus-4

		Each battery 12V,65AH
4	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
5	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
6	20kVA, APC	32 Batteries, Rocket, Each battery 12V,42AH
7	3kVA , APC	6 Batteries, Excide Power Safe Plus. Each battery 12V,26AH
8	10kVA,APC	16 Batteries, Excide Power safe Plus .12V,26AH
9	3kVA,APC	6 Batteries, AMARON 12V,32AH
10	20kVA, Numaric	16 Batteries, AMARON, Each battery 12V, 65AH. 15 Batteries, Excide Power safe Plus .Each Battery 12V,26AH
11	20kVA, APC	32 Batteries, AMARON, Each battery 12V,42AH

b. Diesel generators

The Institute has 2 Diesel Generators with a rating of 200 KVA & 125 KVA with Automatic Changeover for Uninterrupted Supply.
The generator is frequently serviced and well maintained by the maintenance team for efficient working.



5.Energy consumption:

The power requirement of various electrical devices in the institute is as follows

Table 5.1

BLOCK NAME	BLOCK I (MAIN BLOCK-GROUND FLOOR)	BLOCK II (MAIN BLOCK-FIRST FLOOR)	BLOCK III (MAIN BLOCK-SECOND FLOOR)	BLOCK IV (BED Dept. ,MECH LABS)	BLOCK V (GIRLS HOSTEL)	BLOCK VI (BOYS HOSTEL , CANTEEN&AUDITORIUM)	OTHERS	TOTAL	Power Rating (W)	Power consumption (W)
LIGHT TUBE	224	165	185	345	269	73	7	**1268**	40	50720
LIGHT CFL	0	0	9	0	2	0	1	**10**	25	250
LIGHT LED	195	233	115	85	3	167	65	**833**	15	12495
FAN - CEILING	132	153	120	170	177	143	1	**758**	80	60640
FAN - EXHAUST	6	12	4	6	21	9	0	**58**	25	1450
UPS	3	8	4	2	1	1	0	**19**	800	15200
AC 1.5T	7	25	2	2	0	25	0	**61**	1700	103700
AC 2T	14	5	5	7	0	0	0	**31**	2000	62000
COMPUTERS	440	130	150	170	1	1	0	**892**	300	267600
PRINTERS	5	13	1	1	0	1	0	**21**	50	1050
PROJECTORS	7	5	2	3	0	1	0	**18**	150	2700
WATER COOLERS	3	1	3	4	1	2	0	**13**	100	1300
Immersion water heaters					12	12	0	**24**	1000	24000
						TOTAL POWER COSUMPTION				**6,03,105**

Table 5.1 shows the power consumption of various major electrical devices in the campus. The complete campus is divided into six blocks and the area other than these six blocks is shown as others in the table.

6.Energy conservation measures:

Existing power saving methods:

1. Turn off electrical appliances when not in use.
2. Solar water heaters are installed on the Girls and Boys hostel.
3. Power factor improvement devices are installed in the campus.
4. 100 KWP solar roof top is installed in the campus.
5. Common switch for each floor.

Energy saving methods to be implemented:

The following energy saving methods may be implemented in the campus.

1. **Replace the Fluorescent Tube Lights (FTL) with LED Tube Lights.**

The 40 W FTLs can be replaced with the LED tube lights 20 W. These changes can be made at the places where the usage is higher. Usually minimum of 1 year warranty is given and approximate burning hours is 40,000. (15 years considering 6 hours per day running).

Following calculations are done for 6 hours working:

- Power consumption by 36 W FTL with conventional choke = **40 W/ Tube Light.**
- Equivalent LED tube light = **20 W/ Tube Light.**
- Savings in power = **20 W/ Tube Light.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of FTL over an year = 40 W × 1800 h/year = **72 kWh/year/Tube Light**
- Total power usage of LED Tube light over an year = 20 W × 1800 h/year = **36 kWh/year/Tube Light**
- Tube Light Yearly savings = 1,800 x 20W = **36 kWh/year/Tube Light.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 36 kWh x 7.65 = **Rs. 275.4 / year / Tube light.**
- Approximate investment on single LED Tube lights = **Rs. 219** (Panasonic LED 20W Batten, 1 pc).
- Number of Tube Lights to be replaced = **1268**
- Electrical Energy Saved = 36 kWh x 1268 = **45648kWh / year.**

Summary:

Total Investment =1268x Rs.219 = **Rs. 2,77,692/-**

Total Yearly Saving = 1268 x 275.4 =**Rs. 3,49,207 / year**

Payback:

(2,77,692/3,49,207) = 0.79 years = **around 9.5 months**

2. Installing Solar Water Heaters to replace the Immersion water heater

Solar energy is the most useful and abundant source of Green energy. It is a conventional energy resource and emits zero pollution. Solar water heaters transforms solar energy into heat energy by absorbing the radiation of the sunlight. These solar water heaters consumes 0 watts and power saving will be very high.

Following calculations are done for 6 hours working:

- Power consumption of an immersion water heater = **1000 W/ Unit.**
- Power consumption of a Solar water heater= **0 W/ Unit.**
- Savings in power = **1000 W/ Unit.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of immersion water heater over a year = 1000 W × 1800 h/year = **1,800 kWh/year/Unit.**
- Total power usage of Solar water heater over a year = 0 W × 1800 h/year = **0 kWh/year**
- Solar Water Heaters yearly savings = 1,800 x1000 W = **1,800 kWh/year/Unit.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 1800 kWh x 7.65 = **Rs. 13,770 / year / Unit**
- Approximate investment of Solar Water heater = **Rs. 50,000/-**
- Number of immersed water heaters to be replaced =**24**
- Electrical Energy Saved = 1,800 kWh x 24 = **43,200 kWh / year.**

Summary:

Total Investment = 4 x Rs.50,000 = **Rs.2,00,000/-**

(Here we don't need to install the Solar water heaters of the same number of immersed water heaters because the quantity of hot water the solar water heater can generate is much greater than the immersed water heaters)

Total Yearly Saving = 24 x 13770 =**Rs. 3,30,480 /-**

Payback:

(2,00,000 /3,30,480) = 0.605 years = **around 7 months**

3. **Replace the CFL Lights with LED Lights.**

The 25 W CFL lights can be replaced with the LED lights of 10 W. These changes can be made at the places where the required intensity of lighting is low.

Following calculations are done for 6 hours working:

- Power consumption by CFL lights = **25 W/ Light.**
- Equivalent LED light = **10 W/ Light.**
- Savings in power = **15 W/ Light.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of CFL lights over an year = 25 W × 1800 h/year = **45 kWh/year/Light**
- Total power usage of LED light over an year = 10 W × 1800 h/year = **18 kWh/year/Light**
- Tube Light Yearly savings = 1,800 x 20W = **27 kWh/year/Light.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 27 kWh x 7.65 = **Rs. 206.55 / year / Light.**
- Approximate investment on single LED lights = **Rs. 212** (Eveready LED 10W Bulb, 1 pc).
- Number of Tube Lights to be replaced = **10**
- Electrical Energy Saved = 27 kWh x 10 = **270 kWh / year.**

Summary:

Total Investment =10 x Rs.212 = **Rs. 2,120/-**

Total Yearly Saving = 10 x 206.55 =**Rs. 2065.5 / year**

Payback: (2120/2065.5) = 1.02 years = **around 13 months**

7.RECOMMENDATIONS/ SUGGESTIONS:

For Improving Energy Consumption:

- Every classroom and lab with central switch board can have a diagram linking location of a tube light, fan etc. with corresponding switch. This will ensure that correct fitting is switched on/ off and can save time & unnecessary operation.
- Installation of automatic lights with sensors can be considered.
- Conduct energy audit every year and determine the lux levels within College. Energy audit can help in reduction in number of light fittings/ energy usage in the College.
- For purchasing new electronic appliances, star rating provided by Bureau of Energy Efficiency (BEE) should be considered. The equipment which has maximum star ratings could be purchased, which will consume less energy, ensure environmental sustainability and also operate at low cost.
- Usage of light reflectors is recommended as the reflectors can spread light to relatively large areas. Notices/ signages can be put up/ displayed near switches and on notice boards, informing students and staff to switch off all electricals when not in use.
- Control sensors can help to reduce consumption by automatically dimming lights when people are not around, and keeping blinds open to use natural light & reduce energy consumption.
- **Raise awareness**: Encourage students to help in monitoring energy consumption & implement corrective actions, Integrate energy education into classroom learning
- **Housekeeping:**

  Curtains – Always keep curtains closed on windows to prevent direct sunlight inside the room to avoid heating of cooled air. This reduces A.C. load significantly.
- **Better Practices for A.C.:**

  The institute has both split and window type A.C.s which makes a very large part of total energy consumption of the campus. But at many places it was found that AC is not used with best recommended practices. Even simple things such as insulation, damaged windows, poor insulation curtains, etc can effect the power consumption.

Summarized below are some guidelines for most efficient use if A.C.s:

1. **Proper insulation –** Good quality insulation must be maintained in the air-conditioned rooms by keeping all doors and windows closed properly so as to prevent cool air go out and hot air come in.
2. **Operating –** The A.C. should be switched on 15 minutes before actual use and should be switched off before leaving the room.

- **Pumps**
  1. Operate pumping near best efficiency point.
  2. Modify pumping to minimize throttling.
  3. Stop running both pumps -- add an auto-start for an on-line spare or add a booster pump in the problem area.
  4. Use booster pumps for small loads requiring higher pressures.
  5. Increase fluid temperature differentials to reduce pumping rates.
  6. Repair seals and packing to minimize water waste.
- **Motors**
  1. Properly size to the load for optimum efficiency.
  2. Check alignment.
  3. Provide proper ventilation
  4. Check for under-voltage and over-voltage conditions.
  5. Balance the three-phase power supply.
  6. Demand efficiency restoration after motor rewinding.

- All Class Rooms and labs to have Display Messages regarding optimum use of electrical appliances in the room like lights, fans, computers and projectors. Save electricity. Display the stickers of save electricity, save nature everywhere in the campus. So that all stakeholders encouraged to save the electricity.
- Use **motion sensor** in corridors, passage, library, class rooms and toilets.

- Most of the time, all the tube lights in a class room are kept ON, even though, there is sufficient light level near the window opening. In such cases, the light row near the window may be kept OFF.
- All projectors to be kept OFF or in idle mode if there will be no presentation slides. □ All computers to have power saving settings to turn off monitors and hard discs, say after10 minutes/30 minutes.
- Lights in toilet area may be kept OFF during daytime.
- Use Automatic Power Factor Correction (APFC) Panel for PF improvement.
- Need to replace ordinary refrigerator by BEE power saver refrigerator if possible.

COMPUTERS

- Configure your monitor to turn off after 10 minutes of inactivity, your hardware to turn off 20 minutes after your inactivity. Place your PC in a standby mode when you leave office for more than 2hrs.
- Do not use screensaver as energy saver as they cause monitor to continue operating at full power.
- Do not turn on your comp in the morning until you actually need it.
- There is a common misconception that pc's and monitors purchased with energy star logo are efficient, in reality they are built in energy conservation features but PC can't take full advantage of it.

USE OF MASTER SWITCH ON EACH FLOOR

- Installation of master switch can make it easy for a person to switch off all appliances of a room in case someone forgets to switch off while leaving the room.□

UPS SYSTEMS

- Optimizing the number of ups by disconnecting additional ups and improving load and existing working ups.

DVR & Dr. HS MIC COLLEGE OF TECHNOLOGY
Kanchikacherla
Pin : 521180
Ph.273535

PRINCIPAL
Devineni Venkata Ramana & Dr Himasekhar
MIC College of Technology
Kanchikacherla, Krishna District

ENERGY AUDIT REPORT

(2020-2021)

SAVE ENERGY SAVE EARTH

Devineni Venkata Ramana & Dr.Hima Sekhar
MIC College of Technology
(Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada)
Kanchikacherla - 521180, Krishna Dist. A.P. India.
Phone : 08678 - 273535, 273623, Fax: 08678 - 273569
e mail: dvrhsmic@mictech.ac.in, Website: www.mictech.ac.in

AUTONOMOUS
NBA-Accredited B.Tech (CSE|ECE|ME)
Accredited by NAAC With Grade A

Devineni Venkata Ramana & Dr.Hima Sekhar
MIC College of Technology
(Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada)

Kanchikacherla - 521180, Krishna Dist, A.P, India.
Phone : 08678 - 273535, 273623, Fax: 08678 - 273569
e mail: dvrhsmic@mictech.ac.in, Website: www.mictech.ac.in

AUTONOMOUS
NBA-Accredited B.Tech (CSE|ECE|ME)
Accredited by NAAC With Grade A

IOC – Outgoing
DEPARTMENT: EAC
ACADEMIC YEAR:2020-21

QMS – F 061
DATE:12-05-2021
SEMESTER: I&II

Originator	PRINCIPAL
Circulated To	ALL HODs, Office, Library In charge, COE

CIRCULAR

This is to inform that Energy audit is scheduled on **17-05-2021 to 18-05-2021** ie Monday-Tuesday. In this regard , all the HODs and department EAC coordinators are hereby informed to keep the necessary documents(related to A.Y 2020-21 Semister-I & II) updated and ready for smooth conduct of audit.

(Dr.K. Srinivas)
Principal

CC to : CEO for information

DVR & Dr. HS MIC COLLEGE OF TECHNOLOGY Kanchikacherla Pin : 521180 Ph.273535

PRINCIPAL
Devineni Venkata Ramana & Dr Himasekha
MIC College of Technolog
Kanchikacherla, Krishna Distric

ENERGY AUDIT COMMITTEE MEMBERS

Sl.No.	Name of the Staff Member	Designation	Signature
1	Dr. K. Srinivas Principal	Chairman	
2	Mr. P. Pradeep Associate Professor, EEE	Convener	
3	Mr. R. V. Ranjith Kumar Assistant Professor, ME	Member	
4	Mr. K. Prasad Assistant Professor, C.E	Member	
5	Mr. P.N.V Kishore Assistant Professor, B.E.D	Member	
6	A.V. Ravi kumar Assistant Professor, EEE	Member	
7	Mrs. V. Lakshmi Chethana Assistant Professor, CSE	Member	
8	Mr. K. Veenanand Assistant Professor, ECE	Member	
9	Mr. S. Vamsi krishna Electrical Maintenance	Member	

Table of Contents

1. Introduction:

Energy audit is the verification, monitoring, and analysis of how energy is used, including the submission of a technical report with recommendations for increasing energy efficiency with a cost-benefit analysis and an action plan to reduce energy consumption.

A systematic study or survey to identify how energy is being used in a building or plant, and identify energy savings opportunities is done and reducing energy usage by using appropriate audit techniques and an action plan is proposed in this report.

The main Objectives of an Energy Audit are:

i). Review of energy saving opportunities and measures implemented in the audit sites and identification of additional various energy conservation measures and saving opportunities.

ii). Implementation of alternative energy resources for energy saving opportunities and decision making in the field of energy management.

iii). Providing a technical information on how to build an energy balance as well as guidance to be sought for particular applications.

iv). Detailed analysis on the calculation of energy consumption, analysis of latest electricity bill of the campus

v). Use of incandescent (tungsten) bulb and CFL bulbs, fans, air conditioners, cooling apparatus, heaters, computers, photo copiers, inverter, generators and laboratory equipment and instruments installed in the organization

vi). Creating awareness among the stakeholders on energy conservation and utilization.

2.About the college:

MIC Odyssey began in 2002 in Kanchikacherla, a village that boasts of idyllic beauty and serene atmosphere suited for scholastic pursuits. Right from its inception, the College has crossed new vistas making inroads into Quality Education under the dynamic stewardship of our Visionary Chairman Dr. MV Ramana Rao, M.E., Ph.D., CEO & MD MIC Electronics Ltd., Hyderabad.

MIC's tryst with destiny began in 2002 with three branches of B.Tech., (ECE, CSE, and EEE). In 2004, the Mechanical Engineering branch in B. Tech., MCA & MBA courses were added. The College was granted permission to run M.Tech., in Machine Design, PE&D, VLSI&ES, and CSE in 2012. APSCHE approved diploma courses in 2012-13 with two branches: EEE and ME. In 2013-14, two more branches in diploma viz., CE and ECE were approved. In 2013, permission was accorded for B. Tech., in the Civil Engineering branch and 2017, for B.Tech., in Information Technology.

The College was approved by the All India Council for Technical Education (AICTE), New Delhi, and is permanently affiliated with the JNTUK, Kakinada .

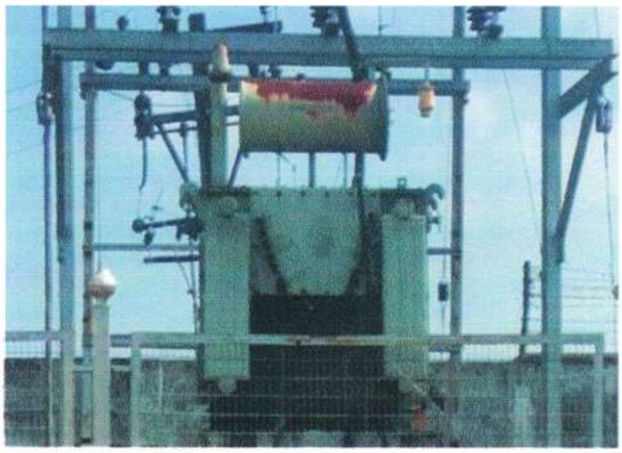
3. Sources of energy:

The major sources of energy for the college include

a. **Electrical grid power supply connection**

The institute have a Three Phase, 11 KV/433 V, 50 HZ distribution transformer supplied by APSPDCL.This is frequently serviced and well maintained for efficient and uninterrupted supply.

This transformer is installed in an isolated area inside the campus and is fully fenced for safety and protection.



b. 100 kWp On-Grid Roof Top Solar Power System

The institute also has **100 kWp On-Grid Roof Top Solar Power System.**

This project is installed under the Program of **New & Renewable Energy Development Corporation of Andhra Pradesh Ltd (NREDCAP)**. The total project cost is Rs. **50Lakhs**. Ministry of New and Renewable Energy (MNRE), Government of India, New Delhi provided a subsidy of 30%.

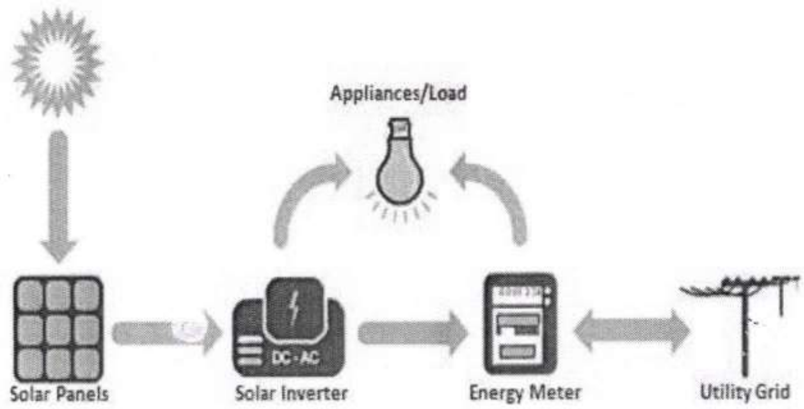
Harnessing the Solar has always been the one of its key drivers at DVR & Dr.HS MIC College of Technology in its Go Green initiatives with the installation of rooftop solar photovoltaic plant. In its pursuit to become energy efficient, DVR & Dr.HS MIC College of Technology, Kanchikacherla, Krishna Dist, Andhrapradesh formally commissioned a total of 100 kWp Solar PV Plant in the year of 2019.

System Specifications:

Total Installed Capacity	100 kWp
PV Modules	330Wp (304no's)
Cell Technology	Polycrystalline
Modules supplier	Green Secure Energy Pvt Ltd
Mounting	Fixed Tilt (45° South & North Facing)
Inverters rating	50KVA (2 no's)
Inverter Make	Polycab Company
Lightning Arresters	1
Earth Pits	4
Installed Year	2019

Description of Roof Top Solar System:

In grid connected rooftop or small solar photovoltaic (SPV) system, the DC power generated from solar panel is converted to AC power using power conditioning unit/Inverter and is fed to the grid.



Main components of a Grid Connected Rooftop Solar PV system:

Solar PV Modules/Solar Panels

Inverter

Module mounting structure

Bi-direction Meters

Balance of System

Solar PV Modules/Solar Panels – The Solar PV modules/Solar Panels convert solar energy to DC (direct current) electrical energy. They are available in different technologies such as crystalline silicon, thin film silicon, etc. Crystalline Silicon Solar PV panels are most commonly used in solar rooftop system. Multiple panels are connected together to form arrays as per the desired capacity of the system.

Inverter – Inverter converts variable DC output of Solar PV panels into AC power. Inverter also synchronizes with the grid so that generated power from the module can be injected into the grid.

Module mounting structure – The module mounting structure, is the support structure that holds the Solar PV panels in place for full system life and is exposed to all weather conditions. These are normally fixed at particular angle and orientation in case of solar rooftop system. But these can also be of type that tracks the Sun, called as trackers.

Bi-direction Meters – Meters are used to record the generation or consumption of electricity. Bi-direction is used to keep track of the electricity that solar PV system injects to utility grid and the electricity that is drawn from the utility grid.

Balance of System – These consist of cables, switchboards, junction boxes, earthling system, circuit breaker, fuses, lightning protection system, etc.

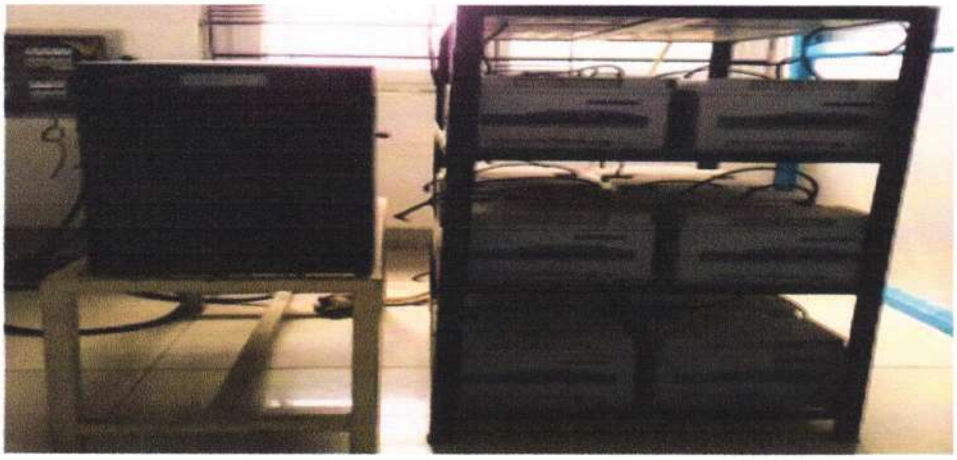
4.Power Backup:

Institute has the facility of power backup system in case of failure of electricity. The power backup system include

a. **UPS and battery banks**

UPS & Battery Banks are provided in all the Computer labs, Library, Exam cell etc.

Generator facility is provided to each and every corner of the college which includes Laboratories, Class rooms, Library, Canteen, Hostel etc.



UPS & Battery bank details:

S.No	UPS Capacity & Make	No of Batteries, Make & Capacity
1	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
2	20kVA, APC	32+4 Batteries, AMARON(32), Excide(4) , Each battery 12V,65AH
3	20kVA, APC	32 Batteries, AMARON-28, Exide power safe Plus-4

		Each battery 12V,65AH
4	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
5	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
6	20kVA, APC	32 Batteries, Rocket, Each battery 12V,42AH
7	3kVA , APC	6 Batteries, Excide Power Safe Plus. Each battery 12V,26AH
8	10kVA,APC	16 Batteries, Excide Power safe Plus .12V,26AH
9	3kVA,APC	6 Batteries, AMARON 12V,32AH
10	20kVA, Numaric	16 Batteries, AMARON, Each battery 12V, 65AH. 15 Batteries, Excide Power safe Plus .Each Battery 12V,26AH
11	20kVA, APC	32 Batteries, AMARON, Each battery 12V,42AH

b. Diesel generators

The Institute has 2 Diesel Generators with a rating of 200 KVA & 125 KVA with Automatic Changeover for Uninterrupted Supply.
The generator is frequently serviced and well maintained by the maintenance team for efficient working.


KIRLOSKAR
GREEN

5.Energy consumption:

The power requirement of various electrical devices in the institute is as follows

Table 5.1

BLOCK NAME	BLOCK I (MAIN BLOCK-GROUND FLOOR)	BLOCK II (MAIN BLOCK-FIRST FLOOR)	BLOCK III (MAIN BLOCK-SECOND FLOOR)	BLOCK IV (BED Dept. ,MECH LABS)	BLOCK V (GIRLS HOSTEL)	BLOCK VI (BOYS HOSTEL , CANTEEN&AUDITORIUM)	OTHERS	TOTAL	Power Rating (W)	Power consumption (W)
LIGHT TUBE	218	160	182	342	269	73	6	**1250**	40	50000
LIGHT CFL	0	0	9	0	2	0	1	**12**	25	300
LIGHT LED	200	238	115	87	3	173	68	**884**	15	13260
FAN - CEILING	145	153	140	180	177	143	1	**939**	80	75120
FAN - EXHAUST	6	12	4	6	21	9	0	**58**	25	1450
UPS	3	8	4	2	1	1	0	**19**	800	15200
AC 1.5T	7	25	2	2	0	25	0	**61**	1700	103700
AC 2T	14	5	5	7	0	0	0	**31**	2000	62000
COMPUTERS	450	135	155	175	1	1	0	**917**	300	275100
PRINTERS	5	13	1	1	0	1	0	**21**	50	1050
PROJECTORS	7	5	2	3	0	1	0	**18**	150	2700
WATER COOLERS	3	1	3	4	1	2	0	**13**	100	1300
Immersion water heaters					12	12	0	**24**	1000	24000
						TOTAL POWER COSUMPTION				**6,25,180**

Table 5.1 shows the power consumption of various major electrical devices in the campus. The complete campus is divided into six blocks and the area other than these six blocks is shown as others in the table.

6.Energy conservation measures:

Existing power saving methods:

1. Turn off electrical appliances when not in use.
2. Solar water heaters are installed on the Girls and Boys hostel.
3. Power factor improvement devices are installed in the campus.
4. 100 KWP solar roof top is installed in the campus.
5. Common switch for each floor.

Energy saving methods to be implemented:

The following energy saving methods may be implemented in the campus.

1. **Replace the Fluorescent Tube Lights (FTL) with LED Tube Lights.**

The 40 W FTLs can be replaced with the LED tube lights 20 W. These changes can be made at the places where the usage is higher. Usually minimum of 1 year warranty is given and approximate burning hours is 40,000. (15 years considering 6 hours per day running).

Following calculations are done for 6 hours working:

- Power consumption by 36 W FTL with conventional choke = **40 W/ Tube Light.**
- Equivalent LED tube light = **20 W/ Tube Light.**
- Savings in power = **20 W/ Tube Light.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of FTL over an year = 40 W × 1800 h/year = **72 kWh/year/Tube Light**
- Total power usage of LED Tube light over an year = 20 W × 1800 h/year = **36 kWh/year/Tube Light**
- Tube Light Yearly savings = 1,800 x 20W = **36 kWh/year/Tube Light.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 36 kWh x 7.65 = **Rs. 275.4 / year / Tube light.**
- Approximate investment on single LED Tube lights = **Rs. 219** (Panasonic LED 20W Batten, 1 pc).
- Number of Tube Lights to be replaced = **1250**
- Electrical Energy Saved = 36 kWh x 1250 = **45000kWh / year.**

Summary:

Total Investment =1250x Rs.219 = **Rs. 2,73,750/-**

Total Yearly Saving = 1250 x 275.4 =**Rs. 3,44,250 / year**

Payback:

(2,73,750/3,44,250) = 0.79 years = **around 9.5 months**

2. Installing Solar Water Heaters to replace the Immersion water heater

Solar energy is the most useful and abundant source of Green energy. It is a conventional energy resource and emits zero pollution. Solar water heaters transforms solar energy into heat energy by absorbing the radiation of the sunlight. These solar water heaters consumes 0 watts and power saving will be very high.

Following calculations are done for 6 hours working:

- Power consumption of an immersion water heater = **1000 W/ Unit.**
- Power consumption of a Solar water heater= **0 W/ Unit.**
- Savings in power = **1000 W/ Unit.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of immersion water heater over a year = 1000 W × 1800 h/year = **1,800 kWh/year/Unit.**
- Total power usage of Solar water heater over a year = 0 W × 1800 h/year = **0 kWh/year**
- Solar Water Heaters yearly savings = 1,800 x1000 W = **1,800 kWh/year/Unit.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 1800 kWh x 7.65 = **Rs. 13,770 / year / Unit**
- Approximate investment of Solar Water heater = **Rs. 50,000/-**
- Number of immersed water heaters to be replaced =**24**
- Electrical Energy Saved = 1,800 kWh x 24 = **43,200 kWh / year.**

Summary:

Total Investment = 4 x Rs.50,000 = **Rs.2,00,000/-**

(Here we don't need to install the Solar water heaters of the same number of immersed water heaters because the quantity of hot water the solar water heater can generate is much greater than the immersed water heaters)

Total Yearly Saving = 24 x 13770 =**Rs. 3,30,480 /-**

Payback:

(2,00,000 /3,30,480) = 0.605 years = **around 7 months**

3. **Replace the CFL Lights with LED Lights.**

The 25 W CFL lights can be replaced with the LED lights of 10 W. These changes can be made at the places where the required intensity of lighting is low.

Following calculations are done for 6 hours working:

- Power consumption by CFL lights = **25 W/ Light.**
- Equivalent LED light = 1**0 W/ Light.**
- Savings in power = **15 W/ Light.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of CFL lights over an year = 25 W × 1800 h/year = **45 kWh/year/Light**
- Total power usage of LED light over an year = 10 W × 1800 h/year = **18 kWh/year/Light**
- Tube Light Yearly savings = 1,800 x 20W = **27 kWh/year/Light.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 27 kWh x 7.65 = **Rs. 206.55 / year / Light.**
- Approximate investment on single LED lights = **Rs. 212** (Eveready LED 10W Bulb, 1 pc).
- Number of Tube Lights to be replaced = **12**
- Electrical Energy Saved = 27 kWh x 12 = **324 kWh / year.**

Summary:

Total Investment =12 x Rs.212 = **Rs. 2,544/-**

Total Yearly Saving = 12 x 206.55 =**Rs. 2478.6 / year**

Payback: (2544/2478.6) = 1.02 years = **around 13 months**

7.RECOMMENDATIONS/ SUGGESTIONS:

For Improving Energy Consumption:

- Every classroom and lab with central switch board can have a diagram linking location of a tube light, fan etc. with corresponding switch. This will ensure that correct fitting is switched on/ off and can save time & unnecessary operation.
- Installation of automatic lights with sensors can be considered.
- Standard Operation Procedures (SOPs) should be prepared and followed for green purchasing. Equipment with star rating, using eco-friendly materials; with safe disposal policy to be preferred. Policy of returning equipment at the end of life span to the supplier to be preferred.
- Conduct energy audit every year and determine the lux levels within College. Energy audit can help in reduction in number of light fittings/ energy usage in the College.
- For purchasing new electronic appliances, star rating provided by Bureau of Energy Efficiency (BEE) should be considered. The equipment which has maximum star ratings could be purchased, which will consume less energy, ensure environmental sustainability and also operate at low cost.

Lighting

- Get into the habit of turning lights off when you leave a room. Saving Energy 0.5 %
- Use task lighting (table and desktop lamps) instead of room lighting.
- Take advantage of daylight
- Compact fluorescent bulbs (CFL):
  1. CFL use 75% less energy than Normal bulbs.
  2. CFL are four times more energy efficient than Normal bulbs.
  3. CFL can last up to ten times longer than a normal bulb.
- Use electronic chokes, in place of conventional copper chokes.

• Use energy-saving light bulbs that can last up to ten times longer than a normal bulb and use significantly less energy. A single 20 to 25 watt energy-saving bulb provides as much light as a 100-watt ordinary bulb.

Air Condition Unit

• Replace air conditioner filters every month.

• Turn off central air conditioning 30 minutes before leaving your home.

• Consider using ceiling or portable fans to circulate and cool the air.

• Try increasing your air conditioner temperature. Even 1 degree higher could mean significant savings, and you will probably not notice the difference.

• Keep central air conditioner usage to a minimum or even turn the unit off if you plan to go away.

• Consider installing a programmable thermostat. Just set the times and temperatures to match your schedule and you will save money and be comfortably cool when you return back.

• If you have a furnace, replace it at the same time as your air conditioner system. Why? Because it is your furnace fan that blows cool air around your home, and a newer furnace fan provides improved air circulation all year round, plus saves energy costs.

Computer / Laptop

• Buy a laptop instead of a desktop

• If you buy a desktop, get an LCD screen instead of an outdated CRT.

• Use sleep-mode when not in use helps cut energy costs by approx 40%

Turn off the monitor; this device alone uses more than half the system's energy.

• Screen savers save computer screens, not energy.

• There is a wrong notion that fan at more speed would consume more current.

• Fan running at slow speed would waste energy as heat in the regulator.

Insulate the ceiling/roof:

- They use two to 10 times less electricity for the same functionality, and are mostly higher quality products that last longer than the less efficient ones. In short, efficient appliances save you lots of energy and money.
- Efficiency rating are mandatory on most appliances. Look Energy Star label is used.
- Educate everyone in the home, including children and domestic helpers.

Pumps

- Operate pumping near best efficiency point.
- Modify pumping to minimize throttling.
- Adapt to wide load variation with variable speed drives or sequenced control of
- smaller offices.
- Stop running both pumps -- add an auto-start for an on-line spare or add a booster pump in the problem area.

Motors

- Properly size to the load for optimum efficiency.
  (High efficiency motors offer of 4 - 5% higher efficiency than standard motors)
- Provide proper ventilation
  (For every 10°C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved)
- Check for under-voltage and over-voltage conditions.

PRINCIPAL
Devineni Venkata Ramana & Dr Himasekhar
MIC College of Technology
Kanchikacherla, Krishna District

ENERGY AUDIT REPORT

(2021-2022)

SAVE ENERGY SAVE EARTH

DVR & Dr. HS
MIC College of Technology
ISO 9001:2015 Certified Institute
(Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada)
Kanchikacherla - 521180, Krishna Dist, A.P, India.
Phones: 08678 - 273535 / 94914 57799 / 73826 16824
E mail: office@mictech.ac.in, Website: www.mictech.edu.in

AUTONOMOUS
NBA-Accredited B.Tech (CSE|ECE|ME)
Accredited by NAAC With Grade A

DVR & Dr. HS
MIC College of Technology
ISO 9001:2015 Certified Institute
(Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada)
Kanchikacherla - 521180, Krishna Dist, A.P. India.
Phones: 08678 - 273535 / 94914 57799 / 73826 16824
E mail: office@mictech.ac.in. Website: www.mictech.edu.in

AUTONOMOUS
NBA-Accredited B.Tech (CSE|ECE|ME)
Accredited by NAAC With Grade A

IOC – Outgoing
DEPARTMENT: EAC
ACADEMIC YEAR:2021-22

QMS – F 061
DATE:11-05-2022
SEMESTER: I&II

Originator	PRINCIPAL
Circulated To	ALL HODs, Office, Library In charge, COE

CIRCULAR

This is to inform that Energy audit is scheduled on **16-05-2022 to 17-05-2022** ie Monday-Tuesday. In this regard , all the HODs and department EAC coordinators are hereby informed to keep the necessary documents(related to A.Y 2021-22 Semister-I & II) updated and ready for smooth conduct of audit.

(Dr. K. Srinivas)
Principal

PRINCIPAL
DVR & Dr. HS MIC College of Technology
Kanchikacherla, Krishna Dt.
Andhra Pradesh, India – Pin: 521180.

CC to : CEO for information

DVR & Dr. HS MIC COLLEGE OF TECHNOLOGY
Kanchikacherla
Pin : 521180
Ph.273535

ENERGY AUDIT COMMITTEE MEMBERS

S.No.	Name of the Staff Member	Designation	Signature
1	Dr. K. Srinivas Principal	Chairman	
2	Dr. P. Pradeep HOD, EEE	Convener	
3	Mr. R. V. Ranjith Kumar Associate Professor, ME	Member	
4	Mr. K. Prasad Assistant Professor, C.E	Member	
5	Mr. P. N. V Kishore Assistant Professor, B.E.D	Member	
6	A.V. Ravi Kumar Assistant Professor, EEE	Member	
7	Mr. D. Varun Prasad Associate Professor, CSE	Member	
8	Mr. G. V. P Chandra Sekhar Assistant Professor, ECE	Member	
9	Mr. S. Vamsi Krishna Electrical Maintenance	Member	

Table of Contents

1.Introduction:

Energy audit is the verification, monitoring, and analysis of how energy is used, including the submission of a technical report with recommendations for increasing energy efficiency with a cost-benefit analysis and an action plan to reduce energy consumption.

A systematic study or survey to identify how energy is being used in a building or plant, and identify energy savings opportunities is done and reducing energy usage by using appropriate audit techniques and an action plan is proposed in this report.

The main Objectives of an Energy Audit are:

i). Review of energy saving opportunities and measures implemented in the audit sites and identification of additional various energy conservation measures and saving opportunities.

ii). Implementation of alternative energy resources for energy saving opportunities and decision making in the field of energy management.

iii). Providing a technical information on how to build an energy balance as well as guidance to be sought for particular applications.

iv). Detailed analysis on the calculation of energy consumption, analysis of latest electricity bill of the campus

v). Use of incandescent (tungsten) bulb and CFL bulbs, fans, air conditioners, cooling apparatus, heaters, computers, photo copiers, inverter, generators and laboratory equipment and instruments installed in the organization

vi). Creating awareness among the stakeholders on energy conservation and utilization.

2.About the college:

MIC Odyssey began in 2002 in Kanchikacherla, a village that boasts of idyllic beauty and serene atmosphere suited for scholastic pursuits. Right from its inception, the College has crossed new vistas making inroads into Quality Education under the dynamic stewardship of our Visionary Chairman Dr. MV Ramana Rao, M.E., Ph.D., CEO & MD MIC Electronics Ltd., Hyderabad.

MIC's tryst with destiny began in 2002 with three branches of B.Tech., (ECE, CSE, and EEE). In 2004, the Mechanical Engineering branch in B. Tech., MCA & MBA courses were added. The College was granted permission to run M.Tech., in Machine Design, PE&D, VLSI&ES, and CSE in 2012. APSCHE approved diploma courses in 2012-13 with two branches: EEE and ME. In 2013-14, two more branches in diploma viz., CE and ECE were approved. In 2013, permission was accorded for B. Tech., in the Civil Engineering branch and 2017, for B.Tech., in Information Technology.

The College was approved by the All India Council for Technical Education (AICTE), New Delhi, and is permanently affiliated with the JNTUK, Kakinada .

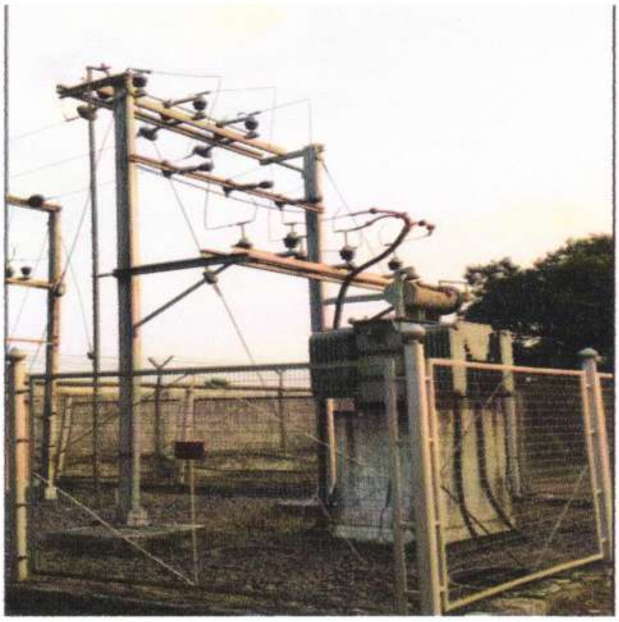
3.Sources of energy:

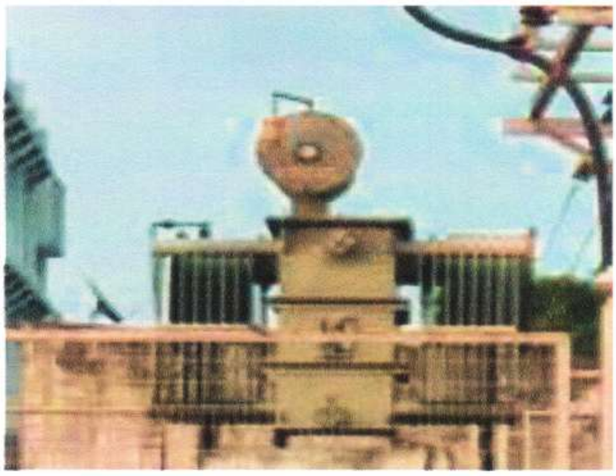
The major sources of energy for the college include

a. Electrical grid power supply connection

The institute have a Three Phase, 11 KV/433 V, 50 HZ distribution transformer supplied by APSPDCL.This is frequently serviced and well maintained for efficient and uninterrupted supply.

This transformer is installed in an isolated area inside the campus and is fully fenced for safety and protection.





b. 100 kWp On-Grid Roof Top Solar Power System

The institute also has **100 kWp On-Grid Roof Top Solar Power System.**

This project is installed under the Program of **New & Renewable Energy Development Corporation of Andhra Pradesh Ltd (NREDCAP)**. The total project cost is Rs. **50Lakhs**. Ministry of New and Renewable Energy (MNRE), Government of India, New Delhi provided a subsidy of 30%.

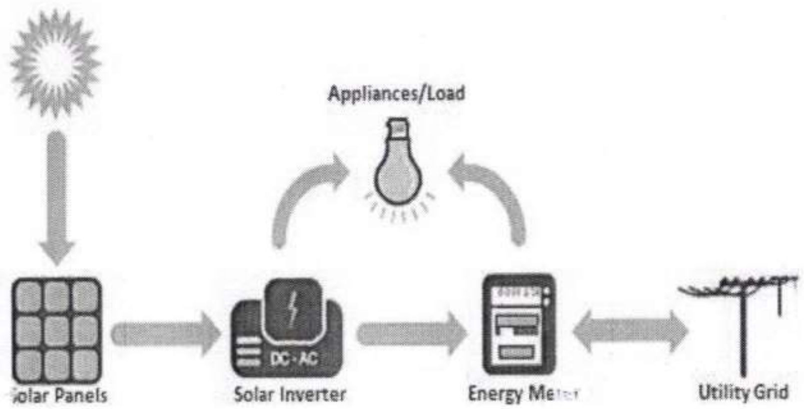
Harnessing the Solar has always been the one of its key drivers at DVR & Dr.HS MIC College of Technology in its Go Green initiatives with the installation of rooftop solar photovoltaic plant. In its pursuit to become energy efficient, DVR & Dr.HS MIC College of Technology, Kanchikacherla, Krishna Dist, Andhrapradesh formally commissioned a total of 100 kWp Solar PV Plant in the year of 2019.

System Specifications:

Total Installed Capacity	100 kWp
PV Modules	330Wp (304no's)
Cell Technology	Polycrystalline
Modules supplier	Green Secure Energy Pvt Ltd
Mounting	Fixed Tilt (45° South & North Facing)
Inverters rating	50KVA (2 no's)
Inverter Make	Polycab Company
Lightning Arresters	1
Earth Pits	4
Installed Year	2019

Description of Roof Top Solar System:

In grid connected rooftop or small solar photovoltaic (SPV) system, the DC power generated from solar panel is converted to AC power using power conditioning unit/Inverter and is fed to the grid.



Main components of a Grid Connected Rooftop Solar PV system:

Solar PV Modules/Solar Panels

Inverter

Module mounting structure

Bi-direction Meters

Balance of System

Solar PV Modules/Solar Panels – The Solar PV modules/Solar Panels convert solar energy to DC (direct current) electrical energy. They are available in different technologies such as crystalline silicon, thin film silicon, etc. Crystalline Silicon Solar PV panels are most commonly used in solar rooftop system. Multiple panels are connected together to form arrays as per the desired capacity of the system.

Inverter – Inverter converts variable DC output of Solar PV panels into AC power. Inverter also synchronizes with the grid so that generated power from the module can be injected into the grid.

Module mounting structure – The module mounting structure, is the support structure that holds the Solar PV panels in place for full system life and is exposed to all weather conditions. These are normally fixed at particular angle and orientation in case of solar rooftop system. But these can also be of type that tracks the Sun, called as trackers.

Bi-direction Meters – Meters are used to record the generation or consumption of electricity. Bi-direction is used to keep track of the electricity that solar PV system injects to utility grid and the electricity that is drawn from the utility grid.

Balance of System – These consist of cables, switchboards, junction boxes, earthling system, circuit breaker, fuses, lightning protection system, etc.

4.Power Backup:

Institute has the facility of power backup system in case of failure of electricity. The power backup system include

a. **UPS and battery banks**

UPS & Battery Banks are provided in all the Computer labs, Library, Exam cell etc.

Generator facility is provided to each and every corner of the college which includes Laboratories, Class rooms, Library, Canteen, Hostel etc.

UPS & Battery bank details:

S.No	UPS Capacity & Make	No of Batteries, Make & Capacity
1	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
2	20kVA, APC	32+4 Batteries, AMARON(32), Excide(4) , Each battery 12V,65AH

3	20kVA, APC	32 Batteries, AMARON-28, Exide power safe Plus-4 Each battery 12V,65AH
4	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
5	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
6	20kVA, APC	32 Batteries, Rocket, Each battery 12V,42AH
7	20kVA, APC (Extra UPS)	-
8	3kVA , APC	6 Batteries, Excide Power Safe Plus. Each battery 12V,26AH
9	10kVA,APC	16 Batteries, Excide Power safe Plus .12V,26AH
10	3kVA,APC	6 Batteries, AMARON 12V,32AH
11	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
12	20kVA	16 Batteries, AMARON, Each battery 12V, 65AH. 15 Batteries, Excide Power safe Plus .Each Battery 12V,26AH
13	20kVA, APC	32 Batteries, AMARON, Each battery 12V,42AH
14	20kVA,Numaric	**3 Batteries**, AMARON, Each battery 12V,65AH
15	20kVA, APC	32 Batteries, AMARON, Each battery 12V,42AH

b. Diesel generators

The Institute has 2 Diesel Generators with a rating of 200 KVA & 125 KVA with Automatic Changeover for Uninterrupted Supply.
The generator is frequently serviced and well maintained by the maintenance team for efficient working.

5.Energy consumption:

The power requirement of various electrical devices in the institute is as follows

Table 5.1

BLOCK NAME	BLOCK I (MAIN BLOCK-GROUND FLOOR)	BLOCK II (MAIN BLOCK-FIRST FLOOR)	BLOCK III (MAIN BLOCK-SECOND FLOOR)	BLOCK IV (BED Dept. ,MECH LABS)	BLOCK V (GIRLS HOSTEL)	BLOCK VI (BOYS HOSTEL , CANTEEN&AUDITORIUM)	OTHERS	TOTAL	Power Rating (W)	Power consumption (W)
LIGHT TUBE	211	153	177	339	265	70	4	**1219**	40	48760
LIGHT CFL	0	0	9	0	2	0	1	**12**	25	300
LIGHT LED	208	245	120	91	4	184	74	**926**	15	13890
FAN - CEILING	187	198	158	197	198	163	2	**1103**	80	88240
FAN - EXHAUST	8	14	6	8	24	11	0	**71**	25	1775
UPS	4	9	5	3	1	1	0	**23**	800	18400
AC 1.5T	8	28	3	3	0	28	0	**70**	1700	119000
AC 2T	15	6	6	7	0	0	0	**34**	2000	68000
COMPUTERS	461	145	174	198	1	1	0	**980**	300	294000
PRINTERS	6	15	1	1	0	2	0	**25**	50	1250
PROJECTORS	8	6	2	3	0	1	0	**20**	150	3000
WATER COOLERS	4	1	4	4	1	2	0	**16**	100	1600
Immersion water heaters					10	10		**20**	1000	20000
						TOTAL POWER COSUMPTION				**678215**

Table 5.1 shows the power consumption of various major electrical devices in the campus. The complete campus is divided into six blocks and the area other than these six blocks is shown as others in the table.

6.Energy conservation measures:

Existing power saving methods:

1. Turn off electrical appliances when not in use.
2. Solar water heaters are installed on the Girls and Boys hostel.
3. Power factor improvement devices are installed in the campus.
4. 100 KWP solar roof top is installed in the campus.
5. Common switch for each floor.

Energy saving methods to be implemented:

The following energy saving methods may be implemented in the campus.

1. **Replace the Fluorescent Tube Lights (FTL) with LED Tube Lights.**

The 40 W FTLs can be replaced with the LED tube lights 20 W. These changes can be made at the places where the usage is higher. Usually minimum of 1 year warranty is given and approximate burning hours is 40,000. (15 years considering 6 hours per day running).

Following calculations are done for 6 hours working:

- Power consumption by 36 W FTL with conventional choke = **40 W/ Tube Light.**
- Equivalent LED tube light = **20 W/ Tube Light.**
- Savings in power = **20 W/ Tube Light.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of FTL over an year = 40 W × 1800 h/year = **72 kWh/year/Tube Light**
- Total power usage of LED Tube light over an year = 20 W × 1800 h/year = **36 kWh/year/Tube Light**
- Tube Light Yearly savings = 1,800 x 20W = **36 kWh/year/Tube Light.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 36 kWh x 7.65 = **Rs. 275.4 / year / Tube light.**
- Approximate investment on single LED Tube lights = **Rs. 219** (Panasonic LED 20W Batten, 1 pc).
- Number of Tube Lights to be replaced = **1219**
- Electrical Energy Saved = 36 kWh x 1219 = **43,884 kWh / year.**

Summary:

Total Investment =1219x Rs.219 = **Rs. 2,66,961/-**

Total Yearly Saving = 1219 x 275.4 =**Rs. 3,35,713 / year**

Payback:

(2,66,961/3,35,713) = 0.79 years = **around 9.5 months**

2. Installing Solar Water Heaters to replace the Immersion water heater

Solar energy is the most useful and abundant source of Green energy. It is a conventional energy resource and emits zero pollution. Solar water heaters transforms solar energy into heat energy by absorbing the radiation of the sunlight. These solar water heaters consumes 0 watts and power saving will be very high.

Following calculations are done for 6 hours working:

- Power consumption of an immersion water heater = **1000 W/ Unit.**
- Power consumption of a Solar water heater= **0 W/ Unit.**
- Savings in power = **1000 W/ Unit.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of immersion water heater over a year = 1000 W × 1800 h/year = **1,800 kWh/year/Unit.**
- Total power usage of Solar water heater over a year = 0 W × 1800 h/year = **0 kWh/year**
- Solar Water Heaters yearly savings = 1,800 x1000 W = **1,800 kWh/year/Unit.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 1800 kWh x 7.65 = **Rs. 13,770 / year / Unit**
- Approximate investment of Solar Water heater = **Rs. 50,000/-**
- Number of immersed water heaters to be replaced =**20**
- Electrical Energy Saved = 1,800 kWh x 20 = **36,000 kWh / year.**

Summary:

Total Investment =4 x Rs.50,000 = **Rs.2,00,000/-**

(Here we don't need to install the Solar water heaters of the same number of immersed water heaters because the quantity of hot water the solar water heater can generate is much greater than the immersed water heaters)

Total Yearly Saving = 20 x 13770 =**Rs. 2,75,400 /-**

Payback:

(2,00,000 /2,75,400) = 0.72 years = **around 9 months**

3. **Replace the CFL Lights with LED Lights.**

The 25 W CFL lights can be replaced with the LED lights of 10 W. These changes can be made at the places where the required intensity of lighting is low.

Following calculations are done for 6 hours working:

- Power consumption by CFL lights = **25 W/ Light.**
- Equivalent LED light = 1**0 W/ Light.**
- Savings in power = **15 W/ Light.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of CFL lights over an year = 25 W × 1800 h/year = **45 kWh/year/Light**
- Total power usage of LED light over an year = 10 W × 1800 h/year = **18 kWh/year/Light**
- Tube Light Yearly savings = 1,800 x 20W = **27 kWh/year/Light.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 27 kWh x 7.65 = **Rs. 206.55 / year / Light.**
- Approximate investment on single LED lights = **Rs. 212** (Eveready LED 10W Bulb, 1 pc).
- Number of Tube Lights to be replaced = **12**
- Electrical Energy Saved = 27 kWh x 12 = **324 kWh / year.**

Summary:

Total Investment =12 x Rs.212 = **Rs. 2,544/-**

Total Yearly Saving = 12 x 206.55 =**Rs. 2,479 / year**

Payback:

(2,544/2,479) = 1.02 years = **around 13 months**

7.RECOMMENDATIONS/ SUGGESTIONS:

For Improving Energy Consumption:

- Every classroom and lab with central switch board can have a diagram linking location of a tube light, fan etc. with corresponding switch. This will ensure that correct fitting is switched on/ off and can save time & unnecessary operation.
- Installation of automatic lights with sensors can be considered.
- Standard Operation Procedures (SOPs) should be prepared and followed for green purchasing. Equipment with star rating, using eco-friendly materials; with safe disposal policy to be preferred. Policy of returning equipment at the end of life span to the supplier to be preferred.
- Conduct energy audit every year and determine the lux levels within College. Energy audit can help in reduction in number of light fittings/ energy usage in the College.
- For purchasing new electronic appliances, star rating provided by Bureau of Energy Efficiency (BEE) should be considered. The equipment which has maximum star ratings could be purchased, which will consume less energy, ensure environmental sustainability and also operate at low cost.

Lighting

- Get into the habit of turning lights off when you leave a room. Saving Energy 0.5 %
- Use task lighting (table and desktop lamps) instead of room lighting.
- Take advantage of daylight
- Compact fluorescent bulbs (CFL):
  1. CFL use 75% less energy than Normal bulbs.
  2. CFL are four times more energy efficient than Normal bulbs.
  3. CFL can last up to ten times longer than a normal bulb.
- Use electronic chokes, in place of conventional copper chokes.
- Use energy-saving light bulbs that can last up to ten times longer than a normal bulb and use significantly less energy. A single 20 to 25 watt energy-saving bulb provides as much light as a 100-watt ordinary bulb.
- Use tungsten halogen bulbs for spotlight

• Fit external lights with a motion sensor.

Air Condition Unit

• Replace air conditioner filters every month.

• Turn off central air conditioning 30 minutes before leaving your home.

• Consider using ceiling or portable fans to circulate and cool the air.

• Try increasing your air conditioner temperature. Even 1 degree higher could mean significant savings, and you will probably not notice the difference.

• Keep central air conditioner usage to a minimum or even turn the unit off if you plan to go away.

• Consider installing a programmable thermostat. Just set the times and temperatures to match your schedule and you will save money and be comfortably cool when you return back.

• If you have a furnace, replace it at the same time as your air conditioner system. Why? Because it is your furnace fan that blows cool air around your home, and a newer furnace fan provides improved air circulation all year round, plus saves energy costs.

Computer / Laptop

• Buy a laptop instead of a desktop

• If you buy a desktop, get an LCD screen instead of an outdated CRT.

• Use sleep-mode when not in use helps cut energy costs by approx 40%

Turn off the monitor; this device alone uses more than half the system's energy.

• Screen savers save computer screens, not energy.

• There is a wrong notion that fan at more speed would consume more current.

• Fan running at slow speed would waste energy as heat in the regulator.

• The ordinary regulator would take 20 watts extra at low speed.

Insulate the ceiling/roof:

• They use two to 10 times less electricity for the same functionality, and are mostly higher quality products that last longer than the less efficient ones. In short, efficient appliances save you lots of energy and money.

• Efficiency rating are mandatory on most appliances. Look Energy Star label is used.

• The label gives you information on the annual electricity consumption.

• Educate everyone in the home, including children and domestic helpers.

Pumps

- Operate pumping near best efficiency point.
- Modify pumping to minimize throttling.
- Adapt to wide load variation with variable speed drives or sequenced control of
- smaller offices.
- Stop running both pumps -- add an auto-start for an on-line spare or add a booster pump in the problem area.
- Repair seals and packing to minimize water waste.

Motors

- Properly size to the load for optimum efficiency.
  (High efficiency motors offer of 4 - 5% higher efficiency than standard motors)
- Provide proper ventilation
  (For every 10°C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved)
- Check for under-voltage and over-voltage conditions.
- Balance the three-phase power supply.

DVR & Dr. HS MIC COLLEGE OF TECHNOLOGY Kanchikacherla Pin : 521180 Ph.273535

PRINCIPAL
DVR & Dr. HS MIC College of Technology
Kanchikacherla, Krishna Dt.
Andhra Pradesh, India – Pin: 521180.

ENERGY AUDIT REPORT

(2022-2023)

SAVE ENERGY SAVE EARTH

DVR & Dr. HS
MIC College of Technology
ISO 9001:2015 Certified Institute
(Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada)
Kanchikacherla - 521180, NTR Dist, A.P, India.
Phones: 08678 - 273535 / 94914 57799 / 73826 16824
E mail: office@mictech.ac.in, Website: www.mictech.edu.in

AUTONOMOUS
Accredited by NAAC With Grade A

DVR & Dr. HS

MIC College of Technology

AUTONOMOUS

ISO 9001:2015 Certified Institute
(Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada)
Kanchikacherla - 521180, NTR Dist. A.P, India.
Phones: 08678 - 273535 / 94914 57799 / 73826 16824
E mail: office@mictech.ac.in, Website: www.mictech.edu.in

Accredited by NAAC With Grade A

IOC – Outgoing
DEPARTMENT: EAC
ACADEMIC YEAR:2022-23

QMS – F 061
DATE:10-05-2023
SEMESTER: I&II

Originator	PRINCIPAL
Circulated To	ALL HODs, Office, Library In charge, COE

CIRCULAR

This is to inform that Energy audit is scheduled on **15-05-2023 to 16-05-2023** i.e Monday-Tuesday. In this regard , all the HODs and department EAC coordinators are hereby informed to keep the necessary documents(related to A.Y 2022-23 Semister-I & II) updated and ready for smooth conduct of audit.

(Dr. T. Vamsee Kiran)
Principal

PRINCIPAL
DVR & Dr. HS MIC College of Technology
Kanchikacherla, NTR Dt.
Andhra Pradesh, India - 521180

CC to : CEO for information

ENERGYAUDITCOMMITTEEMEMBERS

S.No.	NameoftheStaffMember	Designation	Signature
1	Dr.T.Vamsee Kiran Principal	Chairman	
2	Dr.P.Pradeep HOD, EEE	Convener	
3	Mr.R.V.RanjithKumar AssociateProfessor,ME	Member	
4	Mr.K.Prasad AssistantProfessor, C.E	Member	
5	Mr.P.N.V.Kishore AssistantProfessor, B.E.D	Member	
6	A.V.RaviKumar Assistant Professor, EEE	Member	
7	Mr.D.VarunPrasad AssociateProfessor,CSE	Member	
8	Mr.G.V.PChandraSekhar AssistantProfessor, ECE	Member	
9	Mr.S.VamsiKrishna Electrical Maintenance	Member	Vamsi

Table of Contents

1.Introduction:

Energy audit is the verification, monitoring, and analysis of how energy is used, including the submission of a technical report with recommendations for increasing energy efficiency with a cost-benefit analysis and an action plan to reduce energy consumption.

A systematic study or survey to identify how energy is being used in a building or plant, and identify energy savings opportunities is done and reducing energy usage by using appropriate audit techniques and an action plan is proposed in this report.

The main Objectives of an Energy Audit are:

i). Review of energy saving opportunities and measures implemented in the audit sites and identification of additional various energy conservation measures and saving opportunities.

ii). Implementation of alternative energy resources for energy saving opportunities and decision making in the field of energy management.

iii). Providing a technical information on how to build an energy balance as well as guidance to be sought for particular applications.

iv). Detailed analysis on the calculation of energy consumption, analysis of latest electricity bill of the campus

v). Use of incandescent (tungsten) bulb and CFL bulbs, fans, air conditioners, cooling apparatus, heaters, computers, photo copiers, inverter, generators and laboratory equipment and instruments installed in the organization

vi). Creating awareness among the stakeholders on energy conservation and utilization.

2.About the college:

MIC Odyssey began in 2002 in Kanchikacherla, a village that boasts of idyllic beauty and serene atmosphere suited for scholastic pursuits. Right from its inception, the College has crossed new vistas making inroads into Quality Education under the dynamic stewardship of our Visionary Chairman Dr. MV Ramana Rao, M.E., Ph.D., CEO & MD MIC Electronics Ltd., Hyderabad.

MIC's tryst with destiny began in 2002 with three branches of B.Tech., (ECE, CSE, and EEE). In 2004, the Mechanical Engineering branch in B. Tech., MCA & MBA courses were added. The College was granted permission to run M.Tech., in Machine Design, PE&D, VLSI&ES, and CSE in 2012. APSCHE approved diploma courses in 2012-13 with two branches: EEE and ME. In 2013-14, two more branches in diploma viz., CE and ECE were approved. In 2013, permission was accorded for B. Tech., in the Civil Engineering branch and 2017, for B.Tech., in Information Technology.

The College was approved by the All India Council for Technical Education (AICTE), New Delhi, and is permanently affiliated with the JNTUK, Kakinada.

3.Sources of energy:

The major sources of energy for the college include

a. Electrical grid power supply connection

The institute have a Three Phase, 11 KV/433 V, 50 HZ distribution transformer supplied by APSPDCL.This is frequently serviced and well maintained for efficient and uninterrupted supply.

This transformer is installed in an isolated area inside the campus and is fully fenced for safety and protection.

b. 100 kWp On-Grid Roof Top Solar Power System

The institute also has **100 kWp On-Grid Roof Top Solar Power System.**

Thisprojectisinstalledunder the Program of **N e w & Renewable Energy Development Corporation of Andhra Pradesh Ltd (NREDCAP)**.ThetotalprojectcostisRs.**50Lakhs**. MinistryofNewandRenewableEnergy(MNRE),GovernmentofIndia,NewDelhiprovidedasubsidy of30%.

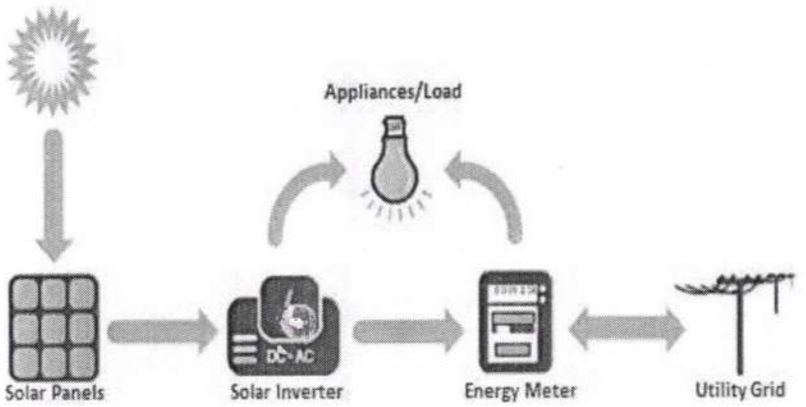
Harnessing the Solar has always been the one of its key drivers at DVR & Dr.HS MIC College of Technology in its Go Green initiatives with the installation of rooftop solar photovoltaic plant. In its pursuit to become energy efficient, DVR & Dr.HS MIC College of Technology, Kanchikacherla, Krishna Dist, Andhrapradesh formally commissioned a total of 100 kWp Solar PV Plant in the year of 2019.

SystemSpecifications:

Total Installed Capacity	100 kWp
PVModules	330Wp(304no's)
CellTechnology	Polycrystalline
Modulessupplier	Green Secure Energy Pvt Ltd
Mounting	Fixed Tilt (45°South & North Facing)
Invertersrating	50KVA (2 no's)
InverterMake	Polycab Company
LightningArresters	1
Earth Pits	4
Installed Year	2019

Description of Roof Top Solar System:

In grid connected rooftop or small solar photovoltaic (SPV) system, the DC power generated from solar panel is converted to AC power using power conditioning unit/Inverter and is fed to the grid.



Main components of a Grid Connected Rooftop Solar PV system:

Solar PV Modules/Solar Panels

Inverter

Module mounting structure

Bi-direction Meters

Balance of System

Solar PV Modules/Solar Panels – The Solar PV modules/Solar Panels convert solar energy to DC (direct current) electrical energy. They are available in different technologies such as crystalline silicon, thin film silicon, etc. Crystalline Silicon Solar PV panels are most commonly used in solar rooftop system. Multiple panels are connected together to form arrays as per the desired capacity of the system.

Inverter – Inverter converts variable DC output of Solar PV panels into AC power. Inverter also synchronizes with the grid so that generated power from the module can be injected into the grid.

Module mounting structure – The module mounting structure, is the support structure that holds the Solar PV panels in place for full system life and is exposed to all weather conditions. These are normally fixed at particular angle and orientation in case of solar rooftop system. But these can also be of type that tracks the Sun, called as trackers.

Bi-direction Meters – Meters are used to record the generation or consumption of electricity. Bi-direction is used to keep track of the electricity that solar PV system injects to utility grid and the electricity that is drawn from the utility grid.

Balance of System – These consist of cables, switchboards, junction boxes, earthling system, circuit breaker, fuses, lightning protection system, etc.

4. Power Backup:

Institute has the facility of power backup system in case of failure of electricity. The power backup system include

a. **UPS and battery banks**

UPS & Battery Banks are provided in all the Computer labs, Library, Exam cell etc.

Generator facility is provided to each and every corner of the college which includes Laboratories, Class rooms, Library, Canteen, Hostel etc.

UPS & Battery bank details:

S.No	UPS Capacity & Make	No of Batteries, Make & Capacity
1	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
2	20kVA, APC	32+4 Batteries, AMARON(32), Excide(4) , Each battery 12V,65AH
3	20kVA, APC	32 Batteries, AMARON-28, Exide power safe Plus-4

		Each battery 12V,65AH
4	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
5	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
6	20kVA, APC	32 Batteries, Rocket, Each battery 12V,42AH
7	20kVA, APC (Extra UPS)	-
8	3kVA , APC	6 Batteries, Excide Power Safe Plus. Each battery 12V,26AH
9	10kVA,APC	16 Batteries, Excide Power safe Plus .12V,26AH
10	3kVA,APC	6 Batteries, AMARON 12V,32AH
11	20kVA, APC	32 Batteries, AMARON, Each battery 12V,26AH
12	20kVA, Numaric	16 Batteries, AMARON, Each battery 12V, 65AH. 15 Batteries, Excide Power safe Plus .Each Battery 12V,26AH
13	20kVA, APC	32 Batteries, AMARON, Each battery 12V,42AH
14	20kVA,Numaric	**3 Batteries**, AMARON, Each battery 12V,65AH
15	20kVA, APC	32 Batteries, AMARON, Each battery 12V,42AH

b. Diesel generators

The Institute has 2 Diesel Generators with a rating of 200 KVA & 125 KVA with Automatic Changeover for Uninterrupted Supply.

The generator is frequently serviced and well maintained by the maintenance team for efficient working.

5.Energy consumption:

The power requirement of various electrical devices in the institute is as follows

Table 5.1

BLOCK NAME	BLOCK I (MAIN BLOCK-GROUND FLOOR)	BLOCK II (MAIN BLOCK-FIRST FLOOR)	BLOCK III (MAIN BLOCK-SECOND FLOOR)	BLOCK IV (BED Dept. ,MECH LABS)	BLOCK V (GIRLS HOSTEL)	BLOCK VI (BOYS HOSTEL , CANTEEN&AUDITORIUM)	OTHERS	TOTAL	Power Rating (W)	Power consumption (W)
LIGHT TUBE	210	140	170	310	250	60	5	**1145**	40	45800
LIGHT CFL	0	0	9	0	2	1	1	**13**	25	325
LIGHT LED	230	260	130	103	7	200	90	**1020**	15	15300
FAN - CEILING	190	205	165	205	200	166	4	**1135**	80	90800
FAN - EXHAUST	8	14	6	8	25	13	0	**74**	25	1850
UPS	4	10	5	3	2	2	1	**27**	800	21600
AC 1.5T	10	28	4	5	0	28	0	**75**	1700	127500
AC 2T	15	6	6	7	0	0	0	**34**	2000	68000
COMPUTERS	470	155	190	210	1	1	0	**1027**	300	308100
PRINTERS	6	15	2	2	0	2	0	**27**	50	1350
PROJECTORS	8	8	3	4	0	1	0	**24**	150	3600
WATER COOLERS	4	2	4	4	1	2	0	**17**	100	1700
Immersion water heaters					5	5		**10**	1000	10000
						TOTAL POWER COSUMPTION				**6,95,925**

Table 5.1 shows the power consumption of various major electrical devices in the campus. The complete campus is divided into six blocks and the area other than these six blocks is shown as others in the table.

6. Energy conservation measures:

Existing power saving methods:

1. Turn off electrical appliances when not in use.
2. Solar water heaters are installed on the Girls and Boys hostel.
3. Power factor improvement devices are installed in the campus.
4. 100 KWP solar roof top is installed in the campus.
5. Common switch for each floor.

Energy saving methods to be implemented:

The following energy saving methods may be implemented in the campus.

1. Replace the Fluorescent Tube Lights (FTL) with LED Tube Lights.

The 40 W FTLs can be replaced with the LED tube lights 20 W. These changes can be made at the places where the usage is higher. Usually minimum of 1 year warranty is given and approximate burning hours is 40,000. (15 years considering 6 hours per day running).

Following calculations are done for 6 hours working:

- Power consumption by 36 W FTL with conventional choke = **40 W/ Tube Light.**
- Equivalent LED tube light = **20 W/ Tube Light.**
- Savings in power = **20 W/ Tube Light.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of FTL over an year = 40 W × 1800 h/year = **72 kWh/year/Tube Light**
- Total power usage of LED Tube light over an year = 20 W × 1800 h/year = **36 kWh/year/Tube Light**
- Tube Light Yearly savings = 1,800 x 20W = **36 kWh/year/Tube Light.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 36 kWh x 7.65 = **Rs. 275.4 / year / Tube light.**
- Approximate investment on single LED Tube lights = **Rs. 219** (Panasonic LED 20W Batten, 1 pc).
- Number of Tube Lights to be replaced = **1145**
- Electrical Energy Saved = 36 kWh x 1145 = **41,220 kWh / year.**

Summary:

Total Investment =1145x Rs.219 = **Rs. 2,50,755/-**

Total Yearly Saving = 1145x 275.4 =**Rs. 3,15,333 / year**

Payback:

(2,50,755/3,15,333) = 0.79 years = **around 9.5 months**

2. **Replace the Induction motor ceiling fans with BLDC motor fans**

The 80 W regular fans can be replaced with the BLDC motor fans of 28 W rating. These changes can be made at every place since the energy saving is very high. There is a negligible amount of heating of the motor and the life of a BLDC fan is also expected to be much higher than ordinary fans.

Following calculations are done for 6 hours working:

- Power consumption of an Induction motor fan = **80 W/ Fan.**
- Power consumption of a BLDC motor fan = **28 W/ Fan.**
- Savings in power = **52 W/ Fan.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of Induction fan over an year = 80 W × 1800 h/year = **144 kWh/year/Fan**
- Total power usage of BLDC Motor fan over an year = 28 W × 1800 h/year = **50.4 kWh/year/Fan**
- BLDC Fan Yearly savings = 1,800 x 52 W = **93.6 kWh/year/Fan.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 93.6 kWh x 7.65 = **Rs. 716.04 / year / Fan.**
- Approximate investment on single BLDC Fan = **Rs. 3.500.**
- Number of ceiling fans to be replaced = **1135**
- Electrical Energy Saved = 93.6 kWh x 1135 = **1,06,236 kWh / year.**

Summary:

Total Investment =1135x Rs.3500 = **Rs. 39,72,500/-**

Total Yearly Saving = 1135x 716.04 =**Rs. 8,12,705.4 / year**

Payback:

(39,72,500/8,12,705.4) = 4.88 years = **around 4 years and 10 months**

3. Installing Solar Water Heaters to replace the Immersion water heater

Solar energy is the most useful and abundant source of Green energy. It is a conventional energy resource and emits zero pollution. Solar water heaters transforms solar energy into heat energy by absorbing the radiation of the sunlight. These solar water heaters consumes 0 watts and power saving will be very high.

Following calculations are done for 6 hours working:

- Power consumption of an immersion water heater = **1000 W/ Unit.**
- Power consumption of a Solar water heater= **0 W/ Unit.**
- Savings in power = **1000 W/ Unit.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of immersion water heater over a year = 1000 W × 1800 h/year = **1,800 kWh/year/Unit.**
- Total power usage of Solar water heater over a year = 0 W × 1800 h/year = **0 kWh/year**
- Solar Water Heaters yearly savings = 1,800 x1000 W = **1,800 kWh/year/Unit.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 1800 kWh x 7.65 = **Rs. 13,770 / year / Unit**
- Approximate investment of Solar Water heater = **Rs. 50,000/-**
- Number of immersed water heaters to be replaced =**10**
- Electrical Energy Saved = 1,800 kWh x 10 = **18,000 kWh / year.**

Summary:

Total Investment = 4 x Rs.50,000 = **Rs.2,00,000/-**

(Here we don't need to install the Solar water heaters of the same number of immersed water heaters because the quantity of hot water the solar water heater can generate is much greater than the immersed water heaters)

Total Yearly Saving = 10 x 13770 =**Rs. 1,37,700 /-**

Payback:

(2,00,000 /1,37,700) = 1.45 years = **around 1 year and 5 months**

4. **Replace the CFL Lights with LED Lights.**

The 25 W CFL lights can be replaced with the LED lights of 10 W. These changes can be made at the places where the required intensity of lighting is low.

Following calculations are done for 6 hours working:

- Power consumption by CFL lights = **25 W/ Light.**
- Equivalent LED light = **10 W/ Light.**
- Savings in power = **15 W/ Light.**
- Operating hours = 6 hr/day x 300 = **1,800 h/year.**
- Total power usage of CFL lights over an year = 25 W × 1800 h/year = **45 kWh/year/Light**
- Total power usage of LED light over an year = 10 W × 1800 h/year = **18 kWh/year/Light**
- Tube Light Yearly savings = 1,800 x 20W = **27 kWh/year/Light.**
- Average Cost of electricity = **Rs. 7.65 / kWh.**
- Saving = 27 kWh x 7.65 = **Rs. 206.55 / year / Light.**
- Approximate investment on single LED lights = **Rs. 212** (Eveready LED 10W Bulb, 1 pc).
- Number of Tube Lights to be replaced = **13**
- Electrical Energy Saved = 27 kWh x 13 = **351 kWh / year.**

Summary:

Total Investment =13 x Rs.212 = **Rs. 2,756/-**

Total Yearly Saving = 13 x 206.55 =**Rs. 2,685.15 / year**

Payback:

(2,756/2,685.15) = 1.03 years = **around 13 months**

7. RECOMMENDATIONS/ SUGGESTIONS:

For Improving Energy Consumption:

- Every classroom and lab with central switch board can have a diagram linking location of a tube light, fan etc. with corresponding switch. This will ensure that correct fitting is switched on/ off and can save time & unnecessary operation.
- Installation of automatic lights with sensors can be considered.
- Standard Operation Procedures (SOPs) should be prepared and followed for green purchasing. Equipment with star rating, using eco-friendly materials; with safe disposal policy to be preferred. Policy of returning equipment at the end of life span to the supplier to be preferred.
- Conduct energy audit every year and determine the lux levels within College. Energy audit can help in reduction in number of light fittings/ energy usage in the College.
- For purchasing new electronic appliances, star rating provided by Bureau of Energy Efficiency (BEE) should be considered. The equipment which has maximum star ratings could be purchased, which will consume less energy, ensure environmental sustainability and also operate at low cost.

Lighting

- Get into the habit of turning lights off when you leave a room. Saving Energy 0.5 %
- Use task lighting (table and desktop lamps) instead of room lighting.
- Take advantage of daylight
- Compact fluorescent bulbs (CFL):
  1. CFL use 75% less energy than Normal bulbs.
  2. CFL are four times more energy efficient than Normal bulbs.
  3. CFL can last up to ten times longer than a normal bulb.
- Use electronic chokes, in place of conventional copper chokes.
- Get into the habit of turning lights off when you leave a room.
- Use only one bulb for light fittings with more than one light bulb, or replace additional bulbs with a lower wattage version.

- Use energy-saving light bulbs that can last up to ten times longer than a normal bulb and use significantly less energy. A single 20 to 25 watt energy-saving bulb provides as much light as a 100-watt ordinary bulb.
- Use tungsten halogen bulbs for spotlight
- Fit external lights with a motion sensor.

Air Condition Unit

- Replace air conditioner filters every month.
- Turn off central air conditioning 30 minutes before leaving your home.
- Consider using ceiling or portable fans to circulate and cool the air.
- Try increasing your air conditioner temperature. Even 1 degree higher could mean significant savings, and you will probably not notice the difference.
- Keep central air conditioner usage to a minimum or even turn the unit off if you plan to go away.
- Consider installing a programmable thermostat. Just set the times and temperatures to match your schedule and you will save money and be comfortably cool when you return back.
- Replace air conditioner filters every month.
- Buy the proper size equipment to meet your family's needs an oversized air conditioner unit will waste energy.
- If you have a furnace, replace it at the same time as your air conditioner system. Why? Because it is your furnace fan that blows cool air around your home, and a newer furnace fan provides improved air circulation all year round, plus saves energy costs.

Computer / Laptop

- Buy a laptop instead of a desktop
- If you buy a desktop, get an LCD screen instead of an outdated CRT.
- Use sleep-mode when not in use helps cut energy costs by approx 40%

Turn off the monitor; this device alone uses more than half the system's energy.

- Screen savers save computer screens, not energy.
- Laser printers use more electricity than inkjet printers.
- There is a wrong notion that fan at more speed would consume more current.
- Fan running at slow speed would waste energy as heat in the regulator.

- The ordinary regulator would take 20 watts extra at low speed.
- The energy loss can be compensated by using electronic regulator.

Insulate the ceiling/roof:

- They use two to 10 times less electricity for the same functionality, and are mostly higher quality products that last longer than the less efficient ones. In short, efficient appliances save you lots of energy and money.
- Efficiency rating are mandatory on most appliances. Look Energy Star label is used.
- The label gives you information on the annual electricity consumption.
- Average consumption of electric appliances in different regions in the world, compared with the high efficient models on the market.
- Educate everyone in the home, including children and domestic helpers.

Pumps

- Operate pumping near best efficiency point.
- Modify pumping to minimize throttling.
- Adapt to wide load variation with variable speed drives or sequenced control of
- smaller offices.
- Stop running both pumps -- add an auto-start for an on-line spare or add a
- booster pump in the problem area.
- Use booster pumps for small loads requiring higher pressures.
- Increase fluid temperature differentials to reduce pumping rates.
- Repair seals and packing to minimize water waste.

Motors

- Properly size to the load for optimum efficiency.
  (High efficiency motors offer of 4 - 5% higher efficiency than standard motors)
- Check alignment.
- Provide proper ventilation
  (For every 10°C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved)
- Check for under-voltage and over-voltage conditions.
- Balance the three-phase power supply.
- Demand efficiency restoration after motor rewinding.

Kanchikacherla Pin : 521180 Ph.273535

PRINCIPAL
DVR & Dr HS MIC College of Technology
Kanchikacherla, NTR Dt.
Andhra Pradesh, India - 521180