

COMPREHENSIVE ENERGY AUDIT REPORT
FOR
MAHATMA GANDHI VIDYAMANDIR'S KBH
ARTS, SCIENCE & COMMERCE COLLEGE, NIMGAON, DIST. NASHIK.



DATE OF AUDIT APRIL 12, 2023.

AUDIT CARRIED OUT BY—

MM Consultancy Services, Nashik.



INTRODUCTION.

PROFILE OF MGV's KBH COLLEGE NIMGAON.

. Arts College Nimgaon is situated on rural area at Nimgaon of the Malegaon Tahsil, Nashik District of the Maharashtra State. The College has opened the pathway of higher education to the youth. The college is established in 2000. Formerly it was known as Arts College Saundane. The college is located at the beauty of nature. A huge playground of the college provides an opportunity to the students to discover their talent in sports and games. The college will be a decent learning centre in the near future.

Hon'ble Samajshree Dr. Prashantdada Hiray, Ex- Minister of Transport and Protocol, Maharashtra State, has started the college at Saundane to provide the facility of higher education to the rural masses by keeping The Motto of the institution is 'Bahujan hitay Bahujan Sukhay' and the path shown by Karmveer Bhausaheb Hiray, the then maker of Historical Tenancy Act and the then Revenue Minister of Bombay Province, the founder of the two leading Institutions viz. Mahatma Gandhi Vidyamandir and Adivasi Seva Mandir on 2 October, 1952 at Nimgaon.

Hon'ble Dr. Apoorva Hiray, the Member of Legislative Council, Maharashtra State has shifted the college at Nimgaon, Tal. Malegaon by keeping the vision to convert the tiny college into the modern Educational Hub along with optimum educational facilities in the near future.

The college continues to impart higher education to the rural students who live in remote rural places. Majority of the students are economically and socially deprived. Along with facilitating the participation of rural students in higher education, its efforts are directed at providing holistic education that encourages critical and independent thinking.

Objectives

- To provide opportunities of higher education to the poor, needy and especially to the down-trodden, and the backward communities of the society
- To impart quality educational facilities to the rural students
- To empower the rural students through curricular and extracurricular activities
- To promote the students to participate in the extracurricular activities
- To strengthen their mental ability, work ethics, commitment to the society and other morale



- To strengthen the communication skills, competitive abilities for the all-round development of the personality
- To explore the best possible ways to realize the noble ideals of Late Karmveer Bhausaheb Hiray, an unfailing source of our inspiration
- To develop the social relevance of knowledge
- To provide opportunities to inculcate integrity, innovation and excellence
- To work with a missionary zeal and be responsive to the social environment for attaining high-ethical standard
- To provide optimum educational facilities to develop skills
- To inculcate sense of commitment among students towards society
- To develop professional skills
- To develop virtues such as, secularism, national integration, commitment to social reformation, humanism, social justice and equality among the students



ACKNOWLEDGEMENT.

MM Consultancy Services Nashik is grateful to the Principal Dr. Ujjan Kadam Sir & Management of Mahatma Gandhi Vidya Mandir's KBH Arts, Science & Commerce College, Nimgaon, Dist. Nashik for giving us an opportunity to carry out a detailed energy audit of their complex to identify potential for energy saving in their complex to optimize energy consumption & energy cost.

Energy Management & Energy Conservation have gained utmost importance today for education institutions as energy costs are on rising day by day & therefore efficient energy management is the need of the hour. Apart from energy savings, energy conservation leads to reduction in Greenhouse gas emissions which improves our environment to protect our planet earth from drastic climate changes & overall natural disturbance. We really appreciate the mission & vision of Shri Apurva Hiray & his team to acknowledge the importance of energy & environment upgrades for sustainable development for present & future generation.

National Assessment & Accreditation Council (NAAC) has also emphasized energy conservation & environment protection for educational institutions by providing an adequate platform for accreditation & Rating to encourage them for special efforts for these noble causes. Needless to say, our present & future generation can survive only if sufficient weightage & importance is given from our end to upgrade our present systems more in line with Nature & natural processes.

We are also grateful to Shri Rahul Jagtap for his coordination with College staff & a prompt assistance to us to ahead for this audit in time.

We are also grateful to Dr. Rajaram Shewale, Dr. Bharat Shewale & their Team for their valuable inputs in data collection during our audit.

Our Sincere thanks to Dr. Kadam Sir Principal who provided us with adequate data & tech. information to make this audit successful. Efforts & initiatives taken by Kadam Sir to make College Campus Beautiful, Green & Energy efficient are really appreciated & we hope, that the same will be continued in future too.



ENERGY SCENARIO.

MGV's KBH College Campus is having electricity supply from MSEB Grid (LT Supply) which meet the power requirement of various sections/departments. Electricity Bills analysis is summarized in following Table-

Month	Units-Kwh	Bill-Rs	Unit Rate-Rs.Kwh	Remarks
Jan-23	598	5284	8.84	
Dec-22	675	5907	8.75	Solar Power Plant
Nov-22	681	5956	8.75	of 10 Kw capacity
Oct-22	348	3261	9.37	is available for
Sep-22	1045	8901	8.52	Additional Power
Aug-22	685	5988	8.74	Generation.
Jul-22	709	6182	8.72	
Jun-22	657	5761	8.77	Expected generation
May-22	730	5717	7.83	from above solar
Apr-22	634	5024	7.92	plant
Mar-22	795	6303	7.93	is 1000 Units
Feb-22	764	5941	7.78	per Month.
TOTAL	8321	70225	8.44	

The energy is utilized in the Campus for lighting, space heating and cooling, running of laboratory instruments, appliances, water heating, ground water pumping, cooking and transportation. The source of energy for all the buildings within the campus is through electricity only.

The institution consumes about 700 KWH per Month maximum as indicated in the above Table. Besides, Concentrated Solar Power Plant of 10 KW Capacity having 32 solar panels is Installed in the Campus provides of the daily additional generation of 40 Units from solar Source. The campus contains Lights and fans in use. Average cost of power purchased from MSEDCCL is estimated @ Rs.8.44 per KWh.



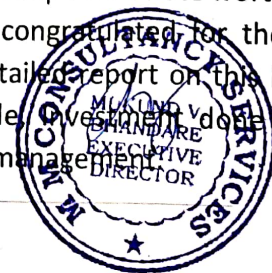
The entire campus including common facility centres are equipped with LED lamps and LED tube lights, except at few locations where these are already provided. Computers are set to automatic power saving mode when not in use. Also, campus administration runs on switch-off drill on regular basis. Noteworthy observation in the campus during our audit is provision of Solar Street Lights with a battery & the whole campus looks very attractive with these solar lamps in evening.

Energy Rating

After the complete survey and analysis of the campus as per ISO 50001:2018 Energy Management System Standards, we rate the campus Score 4/5.

RECOMMENDATIONS.

- As % age of present solar power generation to Total power consumption is more than 1 as solar power generation from 10 Kw solar plant is estimated @ 1200 Units per Month. Considering the power consumption of college campus, excess power generation can be exported to GRID & suitable credit can be obtained from MSEDCL. Present Import from the GRID should be Zero as evident from the Bills from October 2022 onwards.
- A suitable preventive maintenance program is recommended for execution every month to clean the solar panels for optimizing solar generation capacity as the collection of dust & sticky material on the panel surfaces affects drastically the efficiency of solar power generation.
- Existing Ceiling fans may be replaced stepwise with energy efficient BLDC Motor Fans to cut down electricity consumption of existing fans by more than 50 % and therefore capital investment made for this initiative could be recovered within one year.
- All Roof water storage tanks should be provided with Automatic Level Controllers & Level switch to save power as well as overflow water.
- There is no reflection of Imported Units, Exported Units & Solar power generated in the electricity Bill issued by MSEDCL which should be addressed with MSEDCL Officials & suitable credit for excess export should be availed. Also it is highly recommended to record daily solar power generation in a register for a reference so that import, export & solar captive generation can be monitored on regular basis for verification.
- 100 % adaption to LED Energy Efficient lighting in the campus is a note worthy achievements & Principal with his team should be congratulated for their efforts. It is however recommended to prepare a detailed report on this by college management on actual energy savings made, investment done & probable financial pay-back to present before central management.



Benefits of Roof Top Solar System.

- Rooftop solar is a great step toward combatting climate change
- Solar panels contribute to the "green economy"
- Solar power is incredibly efficient
- It can be installed quickly
- Solar energy requires minimal maintenance
- Solar panels have zero emissions.

What's more, solar power operates silently and there is no need for costly transmission infrastructure.

So what are the advantages of rooftop solar panels vs. ground-mounted panels? While each has pros and cons, the benefits of rooftop solar power are hard to ignore.

Homeowners Benefit from Rooftop Solar Panels

As one of the most affordable types of solar products on the market, it's not surprising that rooftop panels represented over 72 percent of all power added in the United States in 2013. The systems are proven to enhance a property's green credentials, and home resiliency. Solar panels can even add thousands of dollars to a home's resale value.

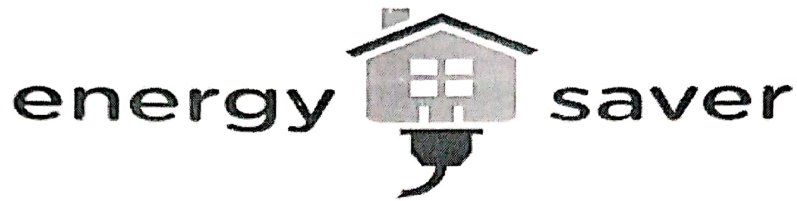
Details of Present Electrical Load Equipment wise.

Ele.Equipment	Numbers	Wattage*	Approx.Hours used	Remarks
LED Tubes	84	20 w	8	
LED Halogens	8	200 w	8	
Ceiling Fans	52	70 w	8	
Computers	54	--	8	
Lab Ovens	1	1450 w	2	Not Regular
Pumps Motors	2	4500 w	4	
Airconditioners	2	1.5 TR	4	Not Regular

Most of the above load except lighting Fans & computer is for a very short time during the year & no special energy conservation required for this load.



ENERGY SAVING TIPS



The light-emitting diode (LED) is today's most energy-efficient and rapidly-developing lighting technology. Quality LED light bulbs last longer, are more durable, and offer comparable or better light quality than other types of lighting. Check out the **top 8 things you didn't know about LEDs** to learn more.

Energy Savings

LED is a highly energy-efficient lighting technology, and has the potential to fundamentally change the future of lighting in the United States. Residential LEDs -- especially ENERGY STAR rated products -- use at least 75% less energy, and last up to 25 times longer, than incandescent lighting.

Widespread use of LED lighting has a large potential impact on energy savings in the United States. By 2035, the majority of lighting installations are anticipated to use LED technology, and energy savings from LED lighting could top 569 TWh annually by 2035, equal to the annual energy output of more than 92 1,000 MW power plants.

How LEDs are Different

LED lighting is very different from other lighting types such as incandescent and CFL. Key differences include:

- Light Source: LEDs are the size of a fleck of pepper, and can emit light in a range of colors. A mix of red, green, and blue LEDs is sometimes used to make white light.
- Direction: LEDs emit light in a specific direction, reducing the need for reflectors and diffusers that can trap light. This feature makes LEDs more efficient for many uses such as recessed downlights and task lighting. With other types of lighting, the light must be reflected to the desired direction and more than half of the light may never leave the fixture.



- Heat: LEDs emit very little heat. In comparison, incandescent bulbs release 90% of their energy as heat and CFLs release about 80% of their energy as heat.
- Lifetime: LED lighting products typically last much longer than other lighting types. A good quality LED bulb can last 3 to 5 times longer than a CFL and 30 times longer than an incandescent bulb.

LED Products

LED lighting is available in a wide variety of home and industrial products, and the list is growing every year. The rapid development of LED technology has resulted in increased product availability, improved manufacturing efficiency, and lower prices. Below are some of the most common types of LED products.

Industrial and Commercial Lighting

The high efficiency and directional nature of LEDs makes them ideal for many industrial uses. LEDs are increasingly common in street lights, parking garage lighting, walkway and other outdoor area lighting, refrigerated case lighting, modular lighting, and task lighting.

Under-Cabinet Lighting

Because LEDs are small and directional, they are ideal for lighting tight spaces such as countertops for cooking and reading recipes. Since there can be variation in light color and directionality, it is important to compare products to find the best fixture for your space.

Recessed Downlights

Recessed downlights are commonly used in residential kitchens, hallways, and bathrooms, and in a number of office and commercial settings. DOE estimates there are more than 600 million recessed downlights installed in U.S. homes and businesses.

LED Replacement Bulbs

With performance improvements and dropping prices, LED lamps can affordably and effectively replace 40, 60, 75, and even 100 Watt incandescent bulbs. It's important to read the Lighting Facts Label to make sure the product is the right brightness and color for its intended use and location.

LED Holiday Lights

LEDs consume far less electricity than incandescent bulbs, and decorative LED light strings such as Christmas tree lights are no different. Not only do



LED holiday lights consume less electricity, they also have the following advantages:

- Safer: LEDs are much cooler than incandescent lights, reducing the risk of combustion or burnt fingers.
- Sturdier: LEDs are made with epoxy lenses, not glass, and are much more resistant to breakage.
- Longer lasting: The same LED string could still be in use 40 holiday seasons from now.
- Easier to install: Up to 25 strings of LEDs can be connected end-to-end without overloading a wall socket.

ENERGY EFFICIENT FANS.

Ceiling fans are not just a fixture but a major home appliance in India. It is used around the clock for the majority of the year. This causes a huge amount of energy consumption by ceiling fans at the residential level itself. Due to rising environmental concerns and issues evoked in creation of energy, there is a need for conservation of energy and available resources for power generation.

BLDC Infographic explains What is BLDC Motor technology and its top benefits
Crompton has introduced the Active BLDC technology in their ceiling fans. This advanced technology has been a boon to consumers as it not only helps reduce energy consumption but also reduced your electricity bill. BLDC motor stands for Brushless Direct Current Motor and as the name suggests, it works on direct current electricity. BLDC motor uses permanent magnets, instead of electromagnets that are used in conventional motors. The permanent magnets of BLDC motor have less energy and heat losses compared to electromagnets. This motor converts the input of alternate current into direct current, and hence this technology works smoothly even at low voltage or power fluctuations. The technology of Active BLDC motor adds an advance mechanical feature to your regular ceiling fan and changes it to a modern appliance to merge with the smart homes of today. Alongside, it brings you a great deal as it reduces your energy consumption by up to 50%.

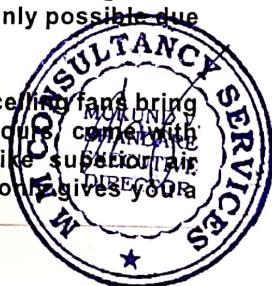
BLDC Fans vs Normal Fans

Calculate your savings on BLDC fans [here](#)

As compared to a conventional ceiling fan, a ceiling fan with Active BLDC technology can generate the same amount of airflow with less energy usage and better power factor. Hence ceiling fans with Active BLDC motors are energy-efficient and give better energy outputs.

Energy Efficient Fans run on Active BLDC motors. BLDC motor fans consume approximately half the power of a traditional motor fans use Active BLDC technology which operates on wide voltage range from 90V-300V. It is observed that a conventional fan's electricity bill comes up to ₹ 2850 annually per fan whereas fans with Active BLDC technology have an electric bill of just of ₹1350, thus saving ₹1500. Also, for 4 fans in a home the saving is ₹6000. This great saving is only possible due to Active BLDC technology.

While using ceiling fans made with Active BLDC technology, these ceiling fans bring an advance touch to your living. They are available in various colours, come with great design, and are equipped with other high-tech features like superior air delivery, smart remote, sleep timer and 5-year warranty, etc. It not only gives you a



great opportunity to cut down on your energy usage but also shows a great reduction in your monthly electricity bill.



APFC PANEL

The Power factor Improvement Unit

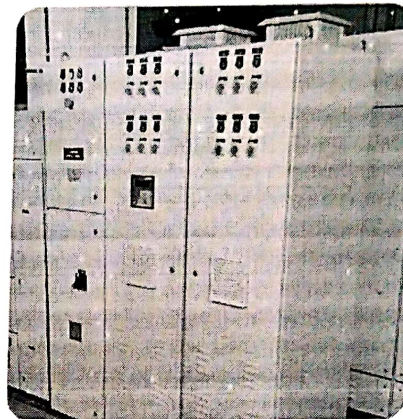
SPECIFICATION- DESIGN

As per IEC-61439,

Full Form :

Automatic power factor Control Panel

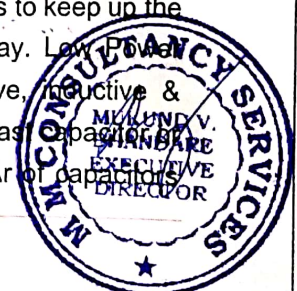
Application :
Reduce Lightbill Penalties



Function of APFC panel is improve the power factor. Most of the electric load is reactive, resulting in poor power factor. Companies distributing electricity encourage consumers to improve power factor. For improving power factor, electricity consumers have to connect

capacitors of optimum rating across inductive load. APFC is an automatic power factor electrical device which is employed to boost the ability factor, whenever required, by switching ON and OFF the desired capacitor bank units automatically.

APFC Panel has microcontroller based programmable controller which switches the capacitor banks of suitable capacity automatically in multiple stages by directly reading the reactive load (RKVA) which works in the principle of VAR sensing tends to keep up the PF to 0.99 Lag. APFC Relay - Automatic Power Factor Controller Relay. Low Power Factor - Harms. In industries we've differing kinds of loads viz. resistive, inductive & capacitive. To improve the facility factor it's required to attach a hard and fast capacitor bank at the LT side of the Transformer. For approximate KVAR of capacitors



required. If the installation has various small loads with the mixture of huge loads then the APFC should be recommended.

APFC panel also known as automatic power factor improvement Panel because, it can control the power factor for reactive loads. Similarly they are designed as per IS standard IS 8623, IEC 60529. In addition, APFC panels provide high quality and reliability.

RTPFC or APFC mainly used for improvement of PF up to 0.999 or Unity. Everybody knows that how much costly electrical bills. In Conclusion, Function of APFC panel is best quality power factor control Panels with best calculation support also design of panel and provide control drawing for APFC Panel

All the ACCU-APFC with metal clad, totally enclosed, rigid, floor mounted, air -insulated, cubical type suitable for operation on three phase / single phase, 415 or 230 volts, 50 Hz. Power control centre panel have designed for minimum expected ambient temperature of 45 degrees Celsius. Also, 80 percent humidity and dusty weather.

Tips For Energy Savings in Computers-

Unplug your computer when not in use

When you're not using your computer, it's best to shut it down and unplug it. This is because a plugged-in PC — even when switched off — still consumes standby power.

2. Disconnect external devices

When they're connected to your PC, devices such as printers, headphones, and webcams consume power even when they're not in use. This is why you should disconnect or remove external devices from your PC once you're done using them.

3. Alternatively, use a smart strip, especially for computers you cannot turn off

A smart strip is a series of several electrical outlets in one strip, with circuits to monitor and maximize your gadgets' power consumption. It can electronically unplug any device so that they stop drawing current, which saves energy. By connecting your PC and peripherals (e.g., printers, scanners) to the smart strip, you won't need to unplug your equipment when you're not using them.

4. Adjust your computer's energy settings

Adjusting your PC's power settings will help you consume less energy. For example, you can opt to put your hard drive and monitor into sleep mode when they're left idle for a few minutes. Lowering the brightness of your screen also saves electricity.

5. Use a charger only when your laptop is charging



When we charge our laptops, we tend to forget about them, leaving them plugged in for hours. Unfortunately, overcharging degrades the battery over time. Leaving the charger plugged in — even if it's not connected to your computer — also consumes standby power.

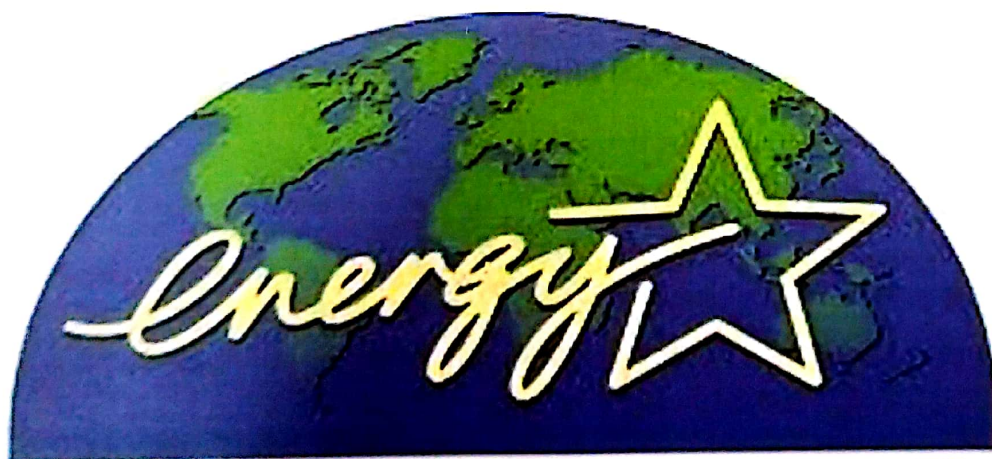
To save energy, make sure to unplug your laptop charger once you're done charging. Alternatively, you can use a wall outlet with a timer or plug your charger into a smart strip.

6. Choose an Energy Star-compliant PC

Energy Star is the US Environmental Protection Agency's symbol for energy efficiency. Every product that earns the Energy Star symbol is guaranteed to deliver both quality performance and energy savings. The more stars a product has, the more energy-efficient it is. Studies show that a single Energy Star-compliant computer and monitor can save between \$7 and \$52 per year in electricity bills.

These tips should help you lower your electricity costs and make smart hardware choices. If you need assistance in choosing the best hardware for your specific needs, give us a call. We'll be glad to help.

It may be difficult to save energy when you use your PC every day. In fact, a complete desktop computer setup (i.e., one that includes an internet modem, a pair of loudspeakers, and a printer) that is on for eight hours a day consumes 600 kWh per year. But don't worry, you can use the above tips to reduce your PC power consumption



Money Isn't All You're Saving



CONCLUSION.

It was really our privilege & honor to work with the team of MGVS KBH Arts, Science & Commerce College Nimgaon at their site for energy auditing activities. We have made sincere efforts to identify energy wastes in almost all the areas of concern & have noted following shortfalls which should be acknowledged & attended to by the campus management.

- Use of Renewable energy in the form of 10 Kw Solar Power Plant is noteworthy & is appreciated.
- Monitoring of solar power generation on day to day basis is highly recommended.
- Data in MSEDCL Bills is not clear as proper import, export & solar generation figures are not recorded. Since the solar generation is much higher than actual import of electricity from MSEDCL, an appropriate credit for excess units exported to MSEDCL should be availed by college management on regular basis.
- Proper preventive maintenance of solar panels on regular basis preferably weekly is highly recommended to optimize capacity utilization to generate minimum 1200 Units per month. Dust & other sticky materials on solar panels affects generation efficiency of solar plant & should be maintained to maximum by regular washing/Cleaning of solar panels.
- Water tank levels should be automatically controlled to avoid unnecessary running of borewell & water pumps. Manual level control of water tanks is not recommended. Suitable level switches to be installed on all the water storage tanks.
- All lighting in the campus are found replaced with energy efficient LED lighting, which is a commendable achievement of the college management.

We once again thank MGVS College Team for their support & cooperation during our site audit & also appreciate the vision of top management including Shri Apurvaji Hiray & Rahul Jagtap to undertake this audit for a very noble cause & wish the college management all success in their efforts to conserve energy on sustainable basis.

Good Luck

MM CONSULTANCY SERVICES TEAM.

