

PRACTICAL VISION CONSULTANTS

We have carried out the preliminary Energy Audit and Assessment for Green Initiatives on 12 June 2018 at Sanjivani Rural Education Society Campus Based on the documentation submitted and our site visit, we certify that this institute has accomplished the necessary framework to implement the green initiatives in following areas

- *Energy Conservation,*
- *Water Conservation,*
- *Use of Renewal Energy,*
- *Reduction of Green House Gases and*
- *Waste management.*

We appreciate the intent of the institute for Environment protection and commitment for conservation of natural resources.

This shall definitely result into nourishment of student education for Green Environment and sustenance of Green March.



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Preliminary Energy Audit

for

SANJIVANI RURAL EDUCATION SOCIETY CAMPUS

At - Sahajanandnagar, post - Shinganapur,

Tal-Kopargaon - 423603, Dist. Ahemadnagar

Prepared by

Practical Vision Consultants, Auranagabad

Audit Date: 12-06-2018

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1 Introduction

1.0 Walk through energy audit :

Organisation Name:	SANJIVANI RURAL EDUCATION SOCIETY CAMPUS
Site Name & Address:	At - Sahajanandnagar, Post - Shinganapur, Tal - Kopargaon-423603, Dist - Ahemadnagar
Buildings included:	Campus area of Sanjivani ACS college Pharmacy college College of Engineering campus area
Date of Visit:	12-06-2018
Walk through energy auditors	Mr. Vivekanand Koranglekar Mr. Shirish Loya Practical Vision Consultants , Aurangabad
Visit Hosted by:	Dr. Dahikar S.B. Principal Sanjivani ACS College Mr. Sutar Mrs. Mhaske Mr. Hajare

1.1 Objective

The objective of this Preliminary Energy Audit, (Walk Through Audit), is primarily to assess the institutes initiatives for the awareness of Environment consciousness among the students and nourish the environmental education among the students studying in college campus along with assessing the progress with respect to previous year's performance.

This objective will be achieved by:

- Identifying a suitable energy performance indicator for existing and target energy use to quantify the potential for energy savings. This also helps to assess the impact of the energy conservation measures in achieving this potential and provide a sense-check of calculations.
- Identifying a suite of measures, including savings and implementation budget, which together are of sufficient scale and combined payback to create a financially viable project suitable for implementation as a single package of works, where appropriate, non-energy savings, such as water or maintenance, will also be quantified.
- Identifying additional metering and recording requirements, including any environmental conditions that are likely to be required for a baseline should the measurement and verification of savings be necessary. The associated installation budget will be included.
- Identifying the yearly calendar dates for environment awareness generation and education by celebrating the respective weeks with environment conservation themes./ arranging expert lectures /seminars in college campus with participation of students.

This Preliminary Energy Audit is not an Investment Grade Audit and has been completed in a relatively short period of time with using readily available site information, sector performance indicators, and rules of thumb. It is a concise, or walkthrough survey that has been prepared with all reasonable skill, care and diligence possible within a short period of time

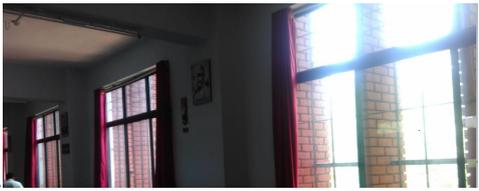
1.2 Description of Site & Scope of Assessment

The Site within the campus of Sanjivani Rural education society forms the scope of Assessment.

This assessment includes the following aspects:

- Electricity / Thermal Energy / Fossil fuel
- Re-enable energy
- Water Conservation
- Green House gas generation
- Waste management

1.3 Brief account of site visit as follow.

Sr No	Site name	Excellent Initiatives for conservation natural resources and energy	PHOTO
01	Solar Panel installation	Use of Solar Energy for generating electricity will help to reduce grid supplied electricity. This is now fully functional and reduction in electric bills will be reflected in next month onwards.	
02	Solar panel supporting shed	The specially created shed to support solar panel serves dual purpose : 1) Firm support to panels at optimum level from ground; i.e. direct access to sunlight and ease of maintenance. 2) Creation of covered assembly area for various college functions	
03	Laboratory	Abundant natural light coming through broad and wide windows across laboratory and lecture hall will significantly reduce the need to use fluorescent tubes, lights. 	 
04	Lecture hall	Excellent natural air ventilation ensures fresh air circulation in lecture hall and reduces the use of electricity for fans 	

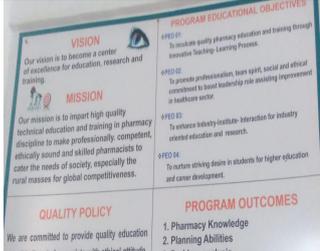
05	Building walls with drain water pipes	Water Harvesting to capture all water on the science building roof is excellent initiative. The proper sloping arrangements on roof at different locations ensures the rain water is carried through pipelines to soak pit.	
06	Soak Pit	Rain water soak pit is created for charging ground by rain water. The soak pit can further be developed as water storage pond.	
07	Passages	Progressive replacement of fluorescent tubes by LED bulbs is resulting in reduced electricity consumption for illumination. The institute had made a resolve to replace every fluorescent tube by LED bulb whenever it stops working.	
08	Laboratory	Enthusiastic members are planning to use the exhaust fan working on natural air current to generate electricity.....may be enough to charge cell phone batteries.	
09	Exit point	All the lecture halls, labs and offices are having one central switch at exit point to switch off all appliance in the hall.	
10	Display Boards	The quality policy, environmental policy boards are displayed at prominent locations to make every member and especially new entrants, aware of institute's commitment to conserve natural resources.	

Table No 1 : Site visit and Observation

2 Energy Consumption

2.1 Annual Energy Consumption

The data regarding electricity consumption was available for the entire campus of Sanjivani Rural Education Society. On similar lines data to be captured for all college buildings for annual energy consumption by installing sub meters for all the institutes in the campus .

Table 2 : Annual Electrical Energy Consumption & Electrical Energy Costs (from Jan 2017 to May 2018) As per the MSEDL Monthly billing to the institute.

Month	Industrial Electricity	Residential Electricity	Total Electricity Units	Total Amount in Rs.
May-18	42535	535	42908	467019
Apr-18	49153	1664	50817	536686
Mar-18	84013	1670	85683	884410
Feb-18	60836	1289	62125	683890
Jan-18	54177	1291	55468	592020
Dec-17	51770	1137	52907	548910
Nov-17	55169	1229	56398	562540
Oct-17	63530	1306	64836	579210
Sep-17	91155	1203	92358	894580
Aug-17	86517	941	87458	890590
Jul-17	87050	1402	88452	834510
Jun-17	56560	1513	58073	640160
May-17	68610	1740	70350	769680
Apr-17	85867	1075	86942	803454
Mar-17	80680	1975	82655	803754
Feb-17	62061	1308	63369	626044
Jan-17	54670	1333	56003	568104

2.2 Main Energy Consumers

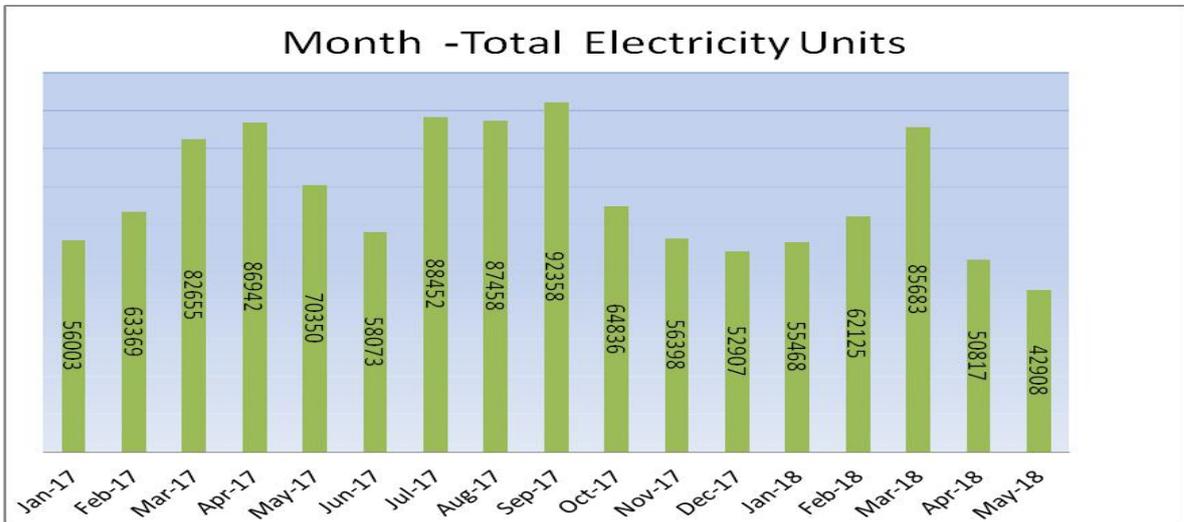
The main energy consumers at the site that have been quantified for this assessment are summarised in Tables 3 below.

Table 3: Equipment wise Summary of Primary Electrical Energy Consumers

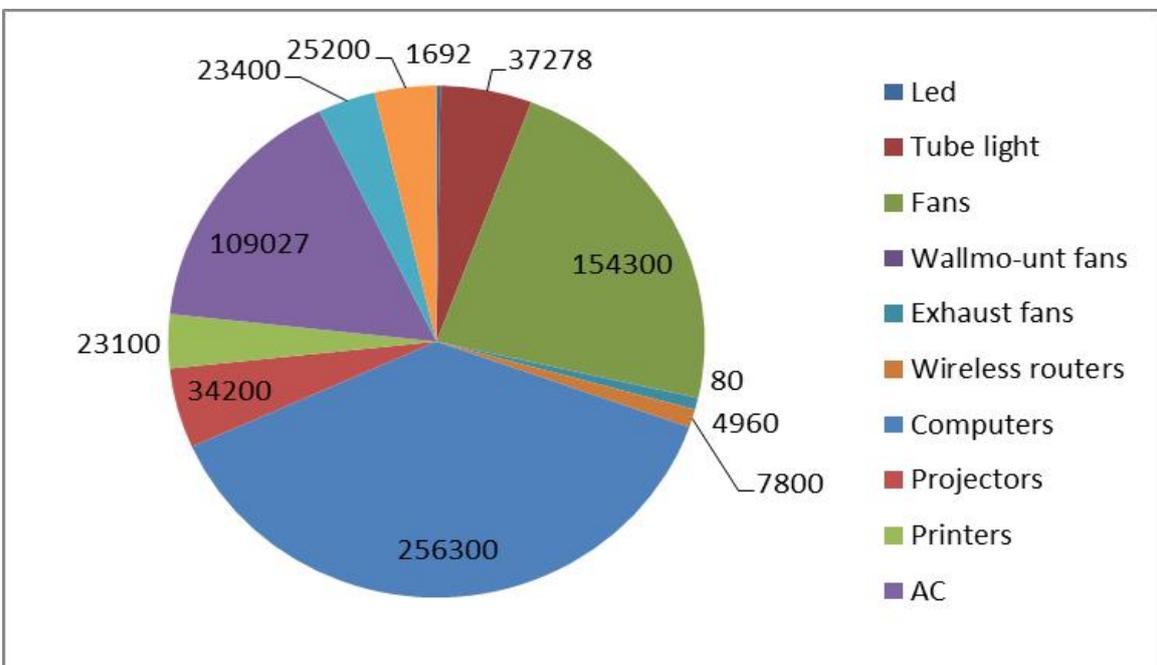
<i>Electric Instrument wise connecting load</i>			
<i>Electric appliances</i>	<i>Total Instruments</i>	<i>Energy consume/ unit</i>	<i>Total Connected load</i>
<i>Led</i>	94	<i>18</i>	1692
<i>Tube light</i>	2071	<i>18</i>	37278
<i>Fans</i>	1543	<i>100</i>	154300
<i>Wallmo-unt fans</i>	1	<i>80</i>	80
<i>Exhaust fans</i>	62	<i>80</i>	4960
<i>Wireless routers</i>	13	<i>600</i>	7800
<i>Computers</i>	1100	<i>233</i>	256300
<i>Projectors</i>	57	<i>600</i>	34200
<i>Printers</i>	99	<i>233.33</i>	23099.67
<i>AC</i>	31	<i>3517</i>	109027
<i>Freeze</i>	13	<i>1800</i>	23400
<i>Water Coolar</i>	14	<i>1800</i>	25200
<i>Totals</i>	5098		677336.7

College wise Distribution of Electric Appliance					
College ->	B. Pharmacy	D. Pharmacy	Jr. college	Engg. college	Total
Led	15	2	7	70	94
Tube light	139	40	114	1778	2071
Fans	110	40	82	1311	1543
Wallmount fans	1	0	0	0	1
Exhaust fans	27	18	1	16	62
Wirelessrouters	1	0	0	12	13
Computers	52	7	9	1032	1100
Projectors	4	2	1	50	57
Printers	8	4	2	85	99
AC	8	0	0	23	31
Freeze	6	3		4	13
Water Cooler	1	0	1	12	14
Totals	372	116	217	4393	5098

Month Wise Electrical Energy Consumption Trend



Energy Equipment Share As Per Connected Load



2.3 Energy Performance

The objective of this subsection is to establish how the facility is performing. The monitoring of energy performance indicator by institute will reflect the effectiveness of energy saving initiatives..

2.3.1 Energy Performance Indicators

The term “Energy Performance Indicator” is used here to reflect trends in energy use in that facility over a period of time.

As suggested in previous audit the following EnPIs at the site is being monitored and shows good improvement as summarised in Tables 4 below :

Table 4: Energy Performance Indicators : SRES CAMPUS

Sr No	SRES CAMPUS Year	Average monthly Elec. Energy Consumption in Rupees	Population (Student + Staff)	Performance Indicators Rs/ Student
1	2016-2017	665382	6306	105.5
2	2017-2018	676210	7043	96.01

2.3.2 Benchmarks

The term “Benchmark” is used here to reflect a comparison of this facilities existing and projected energy use (i.e. when energy saving measures proposed herein are implemented) with industry norms. This Benchmarks gives an indication of existing performance, the potential for further savings and a sense check for the overall savings that this audit has identified.

Table 5: Energy Benchmarks

Monthly Running Average Usage	Electricity KWH	Renewable Energy (Solar) KWH	Remark
2016-17	69536	0	Solar panel installation of 480 KWH is implemented
2017-18	68047	60000	

3 Scope of Natural Resources Conservation

3.1 Recent / Existing Energy-Saving & Environment protection Initiatives

Table 6 : List Of Energy Saving & Environment Projects

<u>Sr No</u>	<u>Project</u>	<u>Category</u>	<u>Status</u>	<u>Impact</u>
1	Solar Water Heater	Renewable Energy	Implemented	Fuel and Electricity billing ↓
2	Solar panel 480 KWH for electricity	Renewable Energy	Implemented	Electricity billing ↓
3	Rain Water Harvesting	Water	Implemented	Water consumption ↓
4	RO reject water circulation	Water	Implemented	Water consumption ↓
5	Strom water, Waste water collection and recycling	Water	Implemented	Water consumption ↓
6	Water Sprinklers	Water	Implemented	Water consumption ↓
7	Street light timers	Electricity	Implemented	Electricity billing ↓
8	No vehicle movement in campus	Fossil Fuel	Implemented	Air & Noise pollution ↓
9	Provision of bus for commuting to reduce individual vehicle usage	Fossil Fuel	Implemented	Air Pollution ↓
10	Curriculum projects undertaken by Final Year students for Energy savings	Electricity, Renewable energy usage, Fossil fuels, Water conservation, GHG reduction , Waste management	Implemented	As academic initiative for environment consciousness among budding engineers.

3.2 Suggested Opportunities for Energy Savings

We identified a number of opportunities for further energy savings at the site; these are summarised as below.

Above measures for energy saving mentioned in 3.1; to be extended to other locations in campus for horizontal deployment.

Further to this, following initiatives to be taken by institute for further saving in all types of energy conservation, preservation of natural resources and protection of environment.

Table no 7 : Projects identified for Opportunities for Energy saving

<u>Sr No</u>	Project	Category	Status	Impact
1	Replacement of Fluorescent tubes by LED bulbs	Electricity	In progress	Increase in Bulb life ↑ and Electricity units ↓
2	Replacement of Window Air conditioner to Split Air Conditioners	Electricity	To Plan	Electricity consumption reduction upto 25% .
3	Remote sensing lighting in isolated area / non traffic zones (Corridors / lawns , Play grounds, Halls)	Electricity	To Plan	Electricity consumption↓
4	AMCs schedules & activities of Equipment such as Pumps / Motors / DG set and Transport vehicles to be reviewed from the point of equipment performance	Electricity, Fossil Fuel	To Plan	To ensure better performance of equipment resulting in reduction of Energy consumption and Air pollution.
5	Bio- gas plant for Canteen Waste	Fossil fuel	To plan	To utilize wastage of food left out.
6	To review the AMC with Housekeeping agency @ the disposal of wastes from campus is done as per Eco guideline and explore the possibility for re use in sugar factory	Waste Management	To plan	To use segregate the wastes as hazardous /Non hazardous Use of campus waste as fuel
7	Additional Building expansion	Green Building	In progress.	To benchmark project as a model of Eco-friendly environment for budding engineers awareness /study

3.3 Activity Metrics

If energy use is driven by other activities (e.g. Hostel occupancy, College Student Population, Running in day/ shift), this will have to be identified.

We suggest following activity metric to be monitored by the institute:

List of activities to be captured in the activity metric may include Electric meter and sub-meter for each building as well as utility, Water meter at intake and usage points, Pollution checks, and category wise waste generation in the campus.

Identify here any activity metrics that should be recorded, Location of measurement unit, the frequency of recording interval, Responsibility of recording and monitoring and the mechanism by which they will be recorded.

Activity Metrics For Energy Profile :

We propose institute to capture the energy usage as per energy type, to monitor the energy usage in KWH and energy cost in Rupees as well as explore the feasibility of using alternative low cost fuel. The energy types are Electricity, Diesel, Petrol, LNG, Solar, Wind, Wood, Coal etc.

4 Conclusions & Next Steps

4.1 SANJIVANI College management commitment

As a part of commitment to Environment consciousness, Institute has made the necessary provision of infrastructure such as Green Policy, Green Committee looking after implementation of Policy by monthly review meetings and recommending the Budgetary provisions for necessary Green initiatives.

The committee has also prepared the yearly calendar for Environmental days identified for the celebration to create the awareness for green Environment among the budding Engineers.

4.2 Mechanism for project proposal review

Environment project review should be based on following simple formula to verify the viability and ROI and Payback period .

$$\text{Simple Payback} = \frac{\text{Total investment budget}}{\text{Expected savings per year}}$$

- Note- if the payback period of any project is less than one year those should be taken on priority basis.
- Record all non-quantified benefits and legal compliances

4.3 Checklist for Environment Consciousness in campus

As a part of Environment Consciousness in the College campus on continual basis, institute is following the checklist as mentioned in the Annexure no 1.

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Appendix 1:**Campus Sustainability Best Practices**

Primarily focuses on energy and climate change, but also includes topics such as campus waste, food, and water usage which can impact climate change.

Based on above College can formulate strategies and ensure the success of campus sustainability programs.

List of initiatives being undertaken by SANJIVANI RURAL EDUCATION SOCIETY CAMPUS

as a part of Campus sustainability to check for adopting the best practices followed.

<u>Initiatives suggested last year</u>	<u>Status on 12 Jun 18</u>
<u>A. Small-Scale Energy Efficiency Initiatives</u>	
Energy Competitions	Preliminary work done
Computer Energy Savings	Replacement by energy efficient screens is in progress
Energy Efficiency in equipment	Initiated
Light Bulb Replacement	In progress
University Heating/Cooling Policy	AC temp to lock on 27 deg. Cel.
<u>B. Large-Scale Efficiency Initiatives</u>	
Metering of Buildings	Separate meters for each building is must for monitoring the impact of various energy conservation initiatives & participation
Cogeneration	Need to explore
<u>C. Renewable Energy Initiatives</u>	
Wind Energy	
Biomass	
Solar/ Photovoltaic Energy	Project is now fully operational
Solar Hot Water	Implemented in hostel
Biomass mixed with Fossil Fuels	Experimentation is under progress
Geothermal	
Renewable Energy Certificates	
Carbon Offsets	
<u>D. Transportation</u>	
Bicycle Initiatives	No personal vehicles within campus is boosting bicycle usage
Commuter Programs	Common buses for staff and students are already in place
Public Transit	
Bio-fuels / Efficiency	
<u>E. Food</u>	

Organic and Local Food	
Gardens and Farming	
Waste Associated with Food	Awareness campaign is run
Food Procurement and Production	
F. <u>Environmental Procurement</u>	
Recycled Paper, Water Bottles	Waste item are segregated at the point of collection
Computer Policies and Electrical items with higher star rating by BEE	Preference is accorded to procure equipment with higher BEE ratings
G. <u>Waste</u>	
E waste Generation, Recycling and Disposal Management	Being followed, but need comprehensive policy for monitoring effectiveness for incentives, promoting awareness programs for conservation and reduction.
Conservation Incentives	
Recycling Awareness Programs	
Reducing Consumption	
H. <u>Green Building Design</u>	
White Roofs	Implemented
Natural ventilation	Excellent implementation
Day lighting	Excellent implementation
I. <u>Water and Ecological Design</u>	
Green Roofs	Initiated
Using Native Plants	Neem tree plantation observed
Parking Improvements	
Reducing Water Consumption	Awareness is observed
Rainwater Harvesting	Excellent implementation
J. <u>Education and Outreach</u>	
Eco-Representatives	Will be monitored
Expanding the Curriculum	Projects to help environment conservation, using labs for extensive analysis are observed
Green Laboratories	
Incorporate Sustainability Awareness Early	
K <u>Innovative Financing</u>	
Revolving Load Fund	At present he management is fully committed to implement green initiatives backed by finance.
Alumni Sustainability Fund	
Project Contracting / Performance Contracts	