Sathyabama Institute of Science and Technology

Alternate Sources of Energy and Energy Conservation Mechanisms Available at the Institution

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

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1. ALTERNATE SOURCES OF ENERGY

Alternate sources of energy and energy conservation mechanisms available at the Institution

1.1. Solar energy

The vast campus area and the prevailing climatic conditions have given scope for the institution to extract the enormously available heat and light intensity of the solar radiation for more than 80% of the days in a year. Capitalizing this the Institution has already installed rooftop solar plant which was got devastated in 2018 floods. The plant was trapping solar energy which was utilized in steam generation that in turn was used for cooking applications thereby reducing the LPG consumption. After the damages, restoration of the system was planned and the authorities have finalized the recommissioning of the Cooking System and set it's target launching time in the next Academic year (2021-2022), by then expecting the pandemic to come to an end leading to functioning of the institution with 100% inmates.

In the campus are found numerous walkways with provisions for seating that creates ambience for the hostelers to relax themselves in the evenings and provide them space for study under natural lighting. These walkways are installed with many Solar Panels and Solar energy generated is used for lightning of the walkway and few adjacent laboratories. Thus, the initiatives taken by the institution for substituting the non-renewable power with renewable source of power, facilitates Sathyabama Institute of Science and Technology in contributing to the Intended Nationally Determined Contributions (INDC) commitment made by Government of India which is highly appreciable. The campus is spread over 134 acres of land, the scope for installation of more solar systems is also available in the institution's Green Initiatives agenda to harness more solar energy by adopting the roof top solar panelling technology. The solar energy thus trapped can be converted into electrical energy for running pumps and blowers in the in house Sewage Treatment Plant (STP) which in turn help to manage the expenditures on electricity as well.

10kW of energy is provided by Si based Solar Cell panels which has been used for lighting of solar roofed pavements with an additional energy input of 13.4W from the prototypes developed in the Centre of Excellence for Energy Research. With the continued operation of the battery operated vehicles, researchers in the Centre of Excellence for Energy Research are

taking up studies to power the battery operated vehicles with solar energy using the third generation solar cells being an outcome of their research

1.2. Biogas plant

Establishment of 20 L capacity biogas unit was initiated earlier as a demonstration facility with food waste as substrate for biogas production. Since the establishment of the institution, measures have been taken to donate the excess food prepared in the institution mess to Ashrams, Oldage homes. The leftovers and waste food (food scraps) have been diverted as feed for animals, the concerned people involve themselves in recovering the scrap food for their animal feed requirement. Thus, the institution right from its foundation is into food recovery hierarchy given below. Being an academic-research institution and having exclusive Research Centres for Waste Management and Energy (Centre of Excellence for Energy Research), a Memorandum of Understanding has been established with Wasmanpro Environmental Solutions LLP, Chennai to divert a percentage of the Food Waste for Biogas unit to meet the LPG expenses borne by the institution for the cooking requirements.

However research continued in establishing a pilot scale MFC for electricity production from food waste as well as exploring the possibilities of converting the food waste into adsorbents for water treatment purposes, so that the activated carbon requirements of the in-house STP and the biodiesel wash water treatment for waste water recovery and reuse for biodiesel refining can be met.

1.3. Wheeling to the Grid

Presently there is no option to transmit power from the Institutional renewable energy sources to the grid, but there are potential renewable sources including large area available for the concentration of solar light and energy intensity, that can be tapped, and technology implemented for the generation of electricity. Windmill generating small power is already installed in the Electrical and Electronics Engineering block. Being near the coastline with vast terrace area available on all the blocks, windmills can be implemented for the conversion of wind energy to electrical energy. 500 W Windmill powers a cabin in the institution leading to fabrication and installation of similar capacity mills in the other buildings to power small cabins. IoT integrated windmills are being planned

1.4. Sensor-based energy conservation

Institute believes in friendly infrastructure that facilitates natural ventilation which helps in reducing the overall temperature by bringing a cooling effect, thus reducing the power consumption. Other initiatives taken at the campus include few rooms in administrative buildings are fitted with motion sensors which is one among different types of energy conservation techniques that enables turning off lights and devices when they are not needed. Newly constructed buildings are planned with sensor installations adopting energy-efficient heating and cooling techniques deployed to sense and monitor the environmental conditions and take decisions based on the inputs. This will help in automatic cut off to maintain the room temperature according to the prevalent environmental conditions thereby favoring optimal energy consumption and conservation.

1.5. Use of LED bulbs/ power-efficient equipment

The primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs. An old incandescent bulb uses approximately 60W to 100W while an energy efficient light emitting diode (LED) uses only less than 10 W. Conventional lighting are getting replaced with LEDs which has ended up in saving several power wattages.

Air-Conditioners are used to maintain comfort in working environment. Hundreds of air conditioners are used in laboratories, administrative buildings, research centres, smart classrooms, libraries, auditoriums, senate halls, conference rooms etc., Regular usage of AC increases monthly electricity bill. The start rating system was devised by the Bureau of Energy Efficiency (BEE) India, with a range of 1 to 5 stars. This system ensures that the energy efficiency of appliances is easily understood by the common man. Cooling capacity, which is a measure of its ability to cool a room. This is expressed in BTU. A 5 star AC will cool a room faster while using lesser electricity than a 3 star AC. At Sathyabama ACs with 5 star rating depicting higher energy efficiency and cooling capacity are installed. In Monetary terms, total cost of ownership of a 5 star AC is lower in the long run as compared to that of a 3 star AC. The electricity consumption of a 5 star AC (1.5 ton) is approximately 1.5 unit per hour; whereas a 3 star AC (1.5 ton) consumes 1.6 unit every hour. Energy Audit pursued annually is enabling the replacement of all possible appliances for which the 5 star rating is Mandatory including Frost Free Refrigerators used in kitchens, Tubular Florescent Lamp,

Distribution Transformer, Room Air Conditioner (Casettes, Floor Standing), Direct Cool Refrigerator Color TV, Electric Geysers used in hostels etc.,

Green campus initiatives include

The institutional initiatives for greening the campus are as follows:

1. Restricted entry of automobiles
2. Use of bicycles/ Battery-powered vehicles
3. Pedestrian-friendly pathways
4. Ban on use of plastic
5. Landscaping

2. INSTITUTION'S INITIATIVES

The institution's initiatives to preserve and improve the environment and harness energy are confirmed through the following:

2.1. Green audit

During the audit conducted it was observed that the area under green cover is approximately 40469.445 sq.m and efforts are continuously taken to increase the green cover by terrace farming, planting of saplings, roof top gardening, vegetable gardening etc. The Institution also has a marshy land area of 5120 sq.m. Planting and caring of trees in and around the campus, various plantation drives involving the students are planned to be organized as the students have started coming to the institution for the offline classes.

Institution is maintaining Marshy Land in its natural form, thereby helping in ground water recharge and even act as a habitat for the birds nearby. An eco-farm developed by the Eco-club in the institution campus for growing vegetables with organic fertilizers is properly maintained. Terrace garden inaugurated in the Chemical Engineering Department is also taken care by the eco-club staff and student members. Various seminars were conducted by online mode and planned by offline mode also to give awareness about various gardening practices to the students, staff. The importance of green coverage emphasizes the study of the various plant species that can be grown, the soil quality and how it can be nurtured, the various mechanisms of plantation, the natural manure and compost and the ways that can be adopted to produce them inhouse. The NSS and Eco-club members , the volunteers involvement is encouraged. Sustainable methods and practices to maintain the green cover are adopted.

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2.2. Energy audit

The supply from TNEB is 30000 kVA of which the pandemic situation with minimal inmates most of the times has lead to reduced utilization of power of about 10,53,090 kVAh. The utilization of power is for the existing infrastructure.10kW of energy is provided by Si based Solar Cell panels which has been used for lighting of solar roofed pavements with an additional energy input of 13.4W from the prototypes developed in the Centre of Excellence for Energy Research.500 W Windmill powers a cabin in the institution leading to fabrication and installation of similar capacity mills in the other buildings to power small cabins. IoT integrated wind mills are being planned.The pandemic situation reduced the generation of solid waste owing to the reduction of inmates during several months in this academic year. Strategies practised earlier were followed to handle the solid waste in an effective manner. However research continued in establishing a pilot scale MFC as well as exploring the possibilities of converting the food waste into adsorbents for water treatment purposes, so that the activated carbon requirements of the in-house STP and the biodiesel wash water treatment for waste water recovery and reuse for biodiesel refining can be met.Apart from providing to the Institution buses, the produced cold flow properties and oxidation stability enhanced Waste Cooking Oil Algal Oil is also provided for irrigation water pump sets. Experiments were also done to use the biodiesel made to operate gensets and proved effective. This measure was taken to divert the biodiesel produced as buses were not operated due to the pandemic situation. With the continued operation of the battery operated vehicles, researchers in the Centre of Excellence for Energy Research are taking up studies to power the battery operated vehicles with solar energy using the third generation solar cells being an outcome of their research. The functioning of the STP continued even during the pandemic situation, but not in full load conditions. The treated water was used for gardening and flushing purposes. Suggestions were given to install solar panels to operate the SBRs so enormous savings in energy could be witnessed. The recommendations will be taken up to power the STP partially with Solar energy.

Periodic maintenance of electrical/electronic equipment is done to optimize the power usage,Usage of Star rated Electric/Electronic Appliances,Air conditioners are set at optimum temperature with fans on to conserve energy ,Use of Solar Lamps to light the Walkways,Use of Solar power to Run the Kitchen, Energy saving through the replacement of incandescent bulbs, CFL lamps and tube lights to LED light,the generators were run with 12% biodiesel

blend to reduce the dependence on conventional power are the other practises of the institution to save energy.

2.3. Environment audit

To create plastic free campus and evolve health consciousness among the stakeholders
Recognize the cost saving methods through waste minimizing and managing
Authenticate conformity with the implemented laws
Empower the organizations to frame a better environmental performance
Enhance the alertness for environmental guidelines and duties
Impart environmental education through systematic environmental management approach and improving environmental standards
Benchmarking for environmental protection initiatives
Financial savings through a reduction in resource use
Development of ownership, personal and social responsibility for the environment
Developing environmental ethics and value systems in youngsters

2.4. Clean and green campus recognitions/awards

Beyond the campus environmental promotional activities
Resource recovery from e-waste
Alumni avenue with flowering plants and trees
Development of ownership, personal and social responsibility for the environment
Developing environmental ethics and value systems in youngsters
Benchmarking for environmental protection and economy saving
Questionaries on waste audit helps in efficient planning and resource management
Water reuse and water management
Technology development and transfer for the livelihood of near by villages
Smart waste compost bin

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