SDG - 7 Clean and Affordable Energy

7.2.3 Carbon Management and Reducing Carbon dioxide Emission

KITS is actively involved in developing innovative scientific and technological solutions to create a sustainable, green campus. In putting Sustainable Development Goals (SDGs) into practice, the Karunya Centre for Conservation and Management of Natural Resources (KCCMN) has initiated various projects grounded in the "Reduce, Reuse, and Recycle" (3Rs) principles to support a cleaner, greener campus.

The primary objectives of KCCMN are: (i) Overall maintenance of campus infrastructure, including buildings, gardens, sports facilities, and playgrounds; (ii) Maintenance and servicing of generators and other electrical systems, recalibration and refilling of fire extinguishers, provision of fire safety protocols, and facilitating access for individuals with disabilities—all managed by the skilled engineers and technical team from the Construction and Maintenance Department (CMD); and (iii) Conducting energy audits to monitor and improve energy efficiency of both conventional and renewable energy sources, aimed at reducing CO_2 emissions.

Following are the steps taken to conserve energy and make the campus Green with less carbon footprint.

1. Usage of Solar Energy – Steps taken, energy saved per annum.

Renewable energy produced during March 2023 – April 2024:

- 95kW Solar Power Plant in Admin Block : 1,24,770 kWh
- 20kW Solar Power Plant in EVR / Oprah
- Mess Building : 23,986 kWh
- Solar Water heating system (87,600 LPD) : 15,45,718 kWh
- Biogas : 58 kWh

Total Renewable Energy Produced : 16,94,532 kWh

2. Conversion to LED - Energy saved every year

(i) 15,066 Nos of Conventional tube lights with 40 watts converted to LED Tube lights with 18 watts respectively from which we saved 81,88,050 units/Annum

3. Sensors in Pumping, Water supply – Water/Electricity Saved

(i) 36 HP of Motor which pumps water to Overhead tank manually is converted to wireless automated water level controller system from which we save 29,734 Units/Annum.

4. Other Steps taken to save energy

- Motion sensor lights are provided in administrative block, corridors and toilets for energy savings. The Institute has an Air Quality Sensor Station which helps to know the air quality.
- The wastage of water due to the overflow in the storage tanks and sumps is controlled by using sensor-based pump operating system. The sumps in the campus and student residences are connected to ensure water supply at all times in the case of any reduction in groundwater level or mechanical failure of pumps in the borewells. Three IoT enabled automated water controllers have been installed in the overhead tanks and sumps by which 20% of water and energy are saved.
- To maintain Unity Power factor, capacitors are installed at the load end in order to save 2, 25,000 Units/Annum.
- The water purifiers in all the buildings are switched off during holidays to save power.
- The timer is fixed for Street Lights in the campus to switch on the lights based on the daylight in order to save electrical energy.
- Training Programs conducted to the entire technician to be implemented for energy savings and safety awareness.

Located in the foothills of Western Ghats, KITS is known for its floral and faunal biodiversity. Taking up the challenges of conserving natural resources and ecosystems, and biodiversity, KITS is actively engaged in developing innovative scientific and technological interventions to build a green campus.

Our university reports its carbon emissions in line with the United Nations Framework Convention on Climate Change

Below mentioned are the details providing the total Scope 1 and 2 carbon emissions in tCO2e (tonnes (t) of carbon dioxide (CO2) equivalent (e).

a) Base line Year: 2015

Total Power Consumption: 7417799 kWh
CO2 Emission- 4989.8 tonnes

b) Reporting year (2023-2024)

Total Electricity Consumption for the campus and residences: **67,48,167 kWh**
CO2 Emissions - **6888.62 metric tons**

CO_2 (electricity)

$$= \frac{electricity\ usage\ per\ year\ (kWh)}{1000} \times 0.84$$

$$= \frac{81{,}90{,}413\ kWh}{1000} \times 0.84$$

= 6,879.94 metric tons

CO_2 (bus)

$$= \frac{number\ of\ shuttle\ bus\ in\ your\ university \times total\ trips\ for\ shuttle\ bus\ service\ each\ day \times approximate\ travel\ distance\ of\ vehicle\ each\ day\ inside\ campus\ only\ (KM) \times}{100}$$

0,01

$$= \frac{13 \times 26 \times 0.2 \times 240}{100} \times 0.01$$

= 1.62 metric tons

CO_2 (cars)

$$= \frac{number\ of\ cars\ entering\ your\ university \times 2 \times approximate\ travel\ distance\ of\ vehicle\ each\ day\ inside\ campus\ only\ (KM) \times 240}{100} \times$$

0,02

$$= \frac{95 \times 2 \times 0.5 \times 240}{100} \times 0.02$$

= 1.62 metric tons

CO_2 (motorcycle)

$$= \frac{number\ of\ motorcycle\ entering\ your\ university \times 2 \times approximate\ travel\ distance\ of\ vehicle\ each\ day\ inside\ campus\ only\ (KM)}{100}$$

0,01

$$= \frac{130 \times 2 \times 0.4 \times 240}{100} \times 0.01$$

= 2.5 metric tons

CO_2 (total)

= 6879.94 + 1.62 + 4.56 + 2.5

= 6,888.62 metric tons

Carbon footprint in March 2023 - April 2024 = 6888.62 metric tons

Total Carbon Footprint

CO2 Emissions - Reporting Year (2023-2024) – **6888.62 metric tons**

Renewable Energy sources

Details of Solar Water Heating System in KITS

Sl.No	Description of Work	Location	Capacity in Litres per Day	Total installed capacity in LPD
1	Solar Water Heating system	Hostel Campus	87600	87,600
			Total capacity	**87,600**
			Total kilo calories	35,04,000
			Total Units Saved per Day	4,793
			Total units saved per Month	1,43,803
			Total units saved per Annum	15,81,833
			Power saving Cost per Annum (Rs)	**1,00,44,640.00**

Solar Water heating system of total capacity of 87,600 LPD is installed in our campus and Electricity power savings per Annum is Rs.1 Crore

Sl.No	Description	Existing Light Fittings	Replaced LED Tube Light fittings
1	Power Consumption	40 Watts	18 Watts
2	No of Light Fittings	15066 Nos	15066 Nos
3	Units consumed per day	4,821 Units	2,169 Units
4	LUX (Intensity of Light)	95 Lx	150 Lx
5	Units consumed per year	15,66,825 Units	7,04,925 units
6	EB Charges/year	Rs. 1,48,84,837/-	Rs. 66,96,787/-
7	Maintenance Charges/Year	Rs. 45,000/-	Replacement warranty upto 3 Years
Electricity Charges Savings/Annum			**Rs,81,88,050/-**

2. SOLAR STREET LIGHTING IN KARUNYA UNIVERSITY

Total lights Installed in Karunya University are 7 lights

Street Light Installed Place	Panel Used	No. of Lights	Present Condition
Guest House	Crystalline Type	4	Working
Opposite to S&H Auditorium	Crystalline Type	2	Working
Mechanical Building Yard	Crystalline Type	1	Working

Specifications for Solar Street Lights

Electrical Parameters

Panel Type : Crystalline Type
Cell Type : High efficiency Solar Cells
Nominal Capacity : 1*120 W
Peak Power Voltage : 16.2 Volts
Peak Current : 8.3 Amps

Tolerance : ± 5%

Mechanical Parameters

Front cover glass : Toughened Glass
Encapsulate : Ethylene Vinyl Acetate (EVA)
Mounting frames : Anodized aluminium channel
Rear panel : Polyvinyl Fluoride (PVF)
Junction box : ABS moulded box
Weight : 5.4 Kgs

Battery

Electrical Parameters

Normal capacity : 100 Ampere Hours
Rated current Discharge : C/10
Normal voltage : 12V
Self-discharge : About 0.5% per week
Expected life : About 1500 cycles

General parameters

Types : low maintenance lead acid
Construction : 12V block
Container material : polypropylene

Solar light controller:

Charge Controller Type And Rating : Series Pulsed Two Step 15A max.

Cable Assembly:

Module to Light Controller : 4.0 m^{2} - cable with ring terminal
Luminary to Lighting Controller : 1.5 m^2 dual sheathed cable
Battery to Lightning : 4.0 m^2 with ring and fork terminal

Renewable Energy Sources (Solar)

Solar Water Heating System in Karunya University Residences

Hostel	Angelina Residence	Hephzibah Residence	Father Duraisamy Residence	Edward George Residence	New JVR Residence	New JMR Residence	New BRR Residence	New Bethany Residence
System Model	TWINWALL model Solar system							
Type of Collector	Flat Plate Collector							
System Capacity	3500 Lts per day	2500 Lts per day	3500 Lts per day	2500 Lts per day	3500 Lts per day	3500 Lts per day	3500 Lts per day	3500 Lts per day
No. of Units	2 Units	3 Units	1 Unit	2 Units	2 Units	2 Units	2 Units	2 Units
System Temperature	60®c	60®c	60®c	60®c	60®c	60®c	60®c	60®c
No. of Solar Collectors	1 set, 28 Collectors	1 set, 20 Collectors	1 set, 28 Collectors	1 set, 20 Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors
Circulation and its Space	Natural Gravity Circulation System Space required 60 m^2 for 3500 LPD System and 45 m^2 for 2500 LPD System							
Application	Hot Water							
Electrical back-up heater	Auxiliary Heating With Electrical Supply of 4 Kw with thermostat							
Tank Capacity	3500 Lts with air vent provision	2500 Lts with air vent provision	3500 Lts with air vent provision	2500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision
Tank Type	Stainless steel storage tanks insulated with Glass wool Cladded with aluminium, Cage type Stainless steel Heat exchanger							
Support stands for tank and collector	Mounted on Concrete floor with steel frame and Anchoring bolts							

Hostel Specifications	**Sevugapandian Residence**	**Sundararaj Residence**	**P R Garg Residence**	**Dakshinamoorthy Residence**	**Oprah Residence**	**Evangeline Residence**
System Model	VESAT Solar Products					
Type of Collector	Flat Plate Collector					
System Capacity	3500 Lts per day	3500 Lts per day	500 Lts per day	3500 Lts per day	3500 Lts per day	3500 Lts per day
No. of Units	2 Units	2 Units	1 Unit	1 Unit	1 Unit	2 Units
System Temperature	60®c	60®c	60®c	60®c	60®c	60®c
No. of Solar Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors
Circulation and its Space	Natural Gravity Circulation System Space required 60 m^2 for 3500 LPD System					
Application	Hot Water					
Electrical back-up heater	Auxiliary Heating With Electrical Supply of 4 kW with thermostat					
Tank Capacity	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision
Tank Type	Stainless steel storage tanks insulated with Glass wool Cladded with aluminium, Cage type Stainless steel Heat exchanger					
Support stands for tank and collector	Mounted on Concrete floor with steel frame and Anchoring bolts					

95 KW GRID TIED SOLAR POWER PLANT IN MAIN BUILDING

The 95 kW Grid – Tied Solar Power Plant was installed on July 1st 2016 in admin Block of the Karunya Institute of Technology and Sciences. The type of Solar panel is Poly crystalline and around 312 panels are connected through four inverters to the Distribution Board from where the Power is drawn to the load. In addition, the Power generation is monitored through online monitoring unit from the inverters.

Salient Features of Solar Power Plant.

1. Grid – Tied 95kW Photo Voltaic Poly Crystalline Solar Power Plant
2. 25 kW Capacity of Inverter of 4 Nos – Make – SMA
3. No of Inverters – 4 Nos
4. No of Strings in each Inverter – 4 Nos
5. No of Solar panels connected in each inverter – 84 Panels (Except 4th inverter - 60 Nos)
6. Total No of Modules (Panels) – 312 Nos (Each – 310 Watts) – Make – EMMVEE

20 KW GRID TIED SOLAR POWER PLANT IN LADIES HOSTEL [EVR BLOCK] BUILDING

Salient Features of Solar Power Plant.

Grid – Tied 20kW Photo Voltaic Poly Crystalline Solar Power Plant
25 kW Capacity of Inverter of 1 No – Make – SMA
No of Inverters – 1 Nos
No of Strings in each Inverter – 4 Nos
No of Solar panels connected in each inverter – 66 Panels
Total No of Modules (Panels) – 16 Nos (Each – 310 Watts) – Make – EMMVEE

95kW Solar Power Plant in Admin Block: 87,473.71 kWh

20kW Solar Power Plant in EVR/Oprah Mess Building: 24,388 kWh

87,600 LPD Solar Water heating system (30 Nos): 15,45,718 kWh

Biogas

- A biogas plant is a decentralized energy system, which leads to self-sufficiency in heat and power needs, and at the same time reduces environmental pollution.
- Biogas is a gas mixture of carbon dioxide (CO2) and methane (CH4), which is generated when organic compounds are fermented in the absence of air (anaerobic fermentation).
- Organic matter such as manure (human or animal) is composed and used to feed the plant.

Biogas plants in Karunya Campus

Being a residential campus, the night soil and food waste generated in the Student Residences of Karunya Campus are treated in the biogas plant installed in the following locations:

Sl. No.	Location	Capacity of the Bio-gas Plant	Year of Installation	Cost of the Plant (in Lakhs)	Savings in terms of LPG Cylinders (19Kg) /Day
1	FDR Campus	$100m^3$	2017	32.0	2 Nos.
2	JMR Campus	$80m^3$	2010	26.0	2 Nos.
3	Ladies Hostel (PRG Campus)	$100m^3$	2017	32.0	2 Nos.
4	Ladies Hostel (EVR Campus)	$80m^3$	2017	26.0	1.5 Nos.

The treated effluent from the biogas plant is diverted to the STP for storage and utilization for irrigation/gardening. This reduces the organic load coming to two STPs of a capacity of 6 and 4.5 lakh litres of sewage and their operational and maintenance cost.