IEM
श्रद्धावान लभते ज्ञानम्
INSTITUTE OF ENGINEERING & MANAGEMENT
Good Education, Good Jobs

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Sustainability Development Report

SDG 7
AFFORDABLE AND CLEAN ENERGY

Executive Summary

The Institute of Engineering and Management (IEM), Kolkata, is committed to SDG 7 by ensuring access to affordable, reliable, and sustainable energy. The campus has implemented a 40 kW grid-connected rooftop solar PV system generating 320 kWh daily, monitored via smart meters. Energy-efficiency measures include LED lighting, sensor-based automation, and timers reducing wastage in classrooms and labs. A biogas plant with a 1000 L digester is planned to convert organic waste to renewable energy. The institute promotes clean transport with EV charging stations and bicycle-sharing. Annual energy consumption from Feb 2024 to Jan 2025 was approximately 1278203 kWh, with campus vehicle emissions at 23.15 tonnes CO_2-equivalent and electricity usage emissions at 894.74 tonnes CO_2-equivalent. Research projects focus on microgrids, greenhouse gas monitoring, and energy footprint analysis, supported by collaborations with government and industry. Sustainability courses are embedded in the curriculum, and awareness programs including Train the Trainers workshops engage community stakeholders. Major challenges include integrating renewable sources into the existing grid, managing intermittency, and ensuring behavioral change for energy conservation. Opportunities exist to scale renewable energy use, deploy smart energy management solutions, and expand partnerships for research and technology transfer. Future plans include increasing rooftop solar capacity, commissioning the biogas plant, implementing smart energy systems in 75% of buildings, expanding EV infrastructure, and advancing carbon footprint monitoring to meet certified reduction targets. These initiatives position IEM as a leader in energy sustainability in higher education.

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Preamble

The Institute of Engineering Management (IEM), Kolkata, is committed to ensuring access to affordable, reliable, sustainable, and modern energy for all, in alignment with Sustainable Development Goal 7 (SDG 7). The institute drives energy transition through on-campus renewable energy installations, energy conservation measures, research, and community engagement.

Vision and Mission

- **Vision:** To establish IEM Kolkata as a benchmark for energy sustainability in higher education, promoting clean energy technologies and efficient resource use.
- **Mission:** To implement renewable energy solutions, optimize energy efficiency, undertake impactful research, and foster awareness leading to reduced carbon footprint.

Key Achievements

- Increasing the capacity and efficiency of grid-connected rooftop solar PV systems with smart metering and energy monitoring to maximize clean energy generation and reduce carbon footprint.
- Establishing biogas facilities utilizing campus organic waste to produce renewable energy, reducing dependency on traditional fossil fuels and promoting waste-to-energy conversion.
- Installing and optimizing timer circuits, occupancy sensors, LED lighting, and LDR-based automation systems across campus buildings to minimize wastage and enhance energy efficiency.
- Promoting electric vehicle use, bicycle-sharing schemes, and restricting conventional vehicles within campus to reduce emissions and foster clean mobility.
- Embedding sustainability-related courses like “Sustainability, Climate Action, and Environmental Science” into academic programs and advancing research in renewable energy, micro-grids, and emissions monitoring through collaborations with industry and academia.
- Conducting awareness programs, training, and partnerships to educate and engage students, faculty, and the wider community on clean energy practices and sustainability goals, including “Train the Trainers” workshops.

Renewable Energy and Energy Efficiency Initiatives

- **Solar Power:**

- IEM has implemented a 40 kW grid-connected rooftop solar photovoltaic system generating approximately 320 kWh of clean energy daily, monitored via smart meters.
- Regular electricity audits cover load and consumption patterns to identify saving opportunities, including smart timer circuits and LDR-based automation to reduce wastage.

- **Biogas Energy:**

  - Plans for a biogas plant featuring a 1000lit digester and 1000-liter gas storage are underway to generate renewable energy from organic waste.

- **Energy Conservation Technologies:**

  - Energy-efficient LED lighting and sensor-based smart lighting systems have been installed across campus to optimize electricity use.
  - Electric appliance timers and smart automation further conserve electricity, especially in classrooms and air-conditioned spaces.
  - Waste segregation including organic, inorganic, and e-waste disposal supports sustainability goals.

- **Sustainable Transport:**

  - Sustainable mobility is encouraged via bicycle sharing programs and electric vehicle charging infrastructure on campus.
  - Initiatives are in place to reduce vehicular emissions by promoting electric and hybrid vehicles.
  - An internal campus-wide energy audit was conducted analysing energy consumption of lighting, fans, ACs, and auxiliary electrical appliances across buildings and laboratories with detailed load measurements supporting informed energy savings planning.
  - Carbon footprint assessment estimated a total of approximately 917.89 tonnes CO_2 equivalent emission annually, divided between electricity consumption (Scope 2) and vehicular emissions (Scope 1).

Thermal Power Plant Visits and Emission Auditing

- Technical visits to Sagardighi, Raghunathpur, and Koderma thermal power stations were conducted by faculty from UEM and Jadavpur University to measure and analyze flue gas emissions, including CO_2, CO, SO_2, NOx, and O_2 concentrations using portable flue gas analyzers.

- The measurements highlighted the significant GHG emissions from coal-fired power plants and underscored the need for cleaner combustion technologies and emission reduction strategies.
- These visits provided real-world exposure for students and researchers and helped in calibrating models to estimate emissions and develop mitigation approaches.

Research and Curriculum Integration

- The Office of Sustainability spearheads energy sustainability research including microgrid systems, GHG monitoring, and energy footprint analysis.
- Collaborative research projects with academic and government institutions explore new-age energy technologies.
- The institute offers a mandatory course, "Sustainability, Climate Action, and Environmental Science," for 4th semester B.Tech students to embed sustainability concepts.
- Sustainable development pilot projects and workshops provide experiential learning, encouraging innovation aligned with SDG 7.
- Real-time online measurement of GHG emissions in thermal power plants supported by Ministry of Environment and UNFCCC.
- Estimation of energy and environmental footprints with economic assessment of micro-grids in India.

Community Engagement and Partnerships

- Sustainability awareness programs, including "Train the Trainers" workshops for schoolteachers, promote clean energy and zero waste principles in surrounding communities.
- Student-led initiatives foster environmental education and community outreach aligned with SDG goals.
- Memoranda of Understanding with government bodies, industry leaders, and academic partners drive research, consultancy, and internships focused on clean energy.
- Collaboration with industrial players facilitates technology transfer and scaling of renewable energy projects.

Environmental Impact and Sustainability Metrics

- Campus energy consumption from Feb 2024 to Jan 2025 totalled 1278203 kWh.
- Scope 1 emissions (campus vehicles) estimated at 23.15 tonnes CO_2 equivalent annually.
- Scope 2 emissions (electricity use) contribute about 894.74 tonnes CO_2 equivalent annually.

- Campus green and plantation area cover approximately 3,173 m², contributing to promoting ecological balance.

Data and Metrics

Metric	Value & Units
Solar PV System Capacity	40 kW
Daily Solar Energy Generation	320 kWh/day
Biogas Digester Volume	1000 liters (planned)
Biogas Storage Capacity	1000 liters (planned)
Annual Campus Energy Consumption	1278203 kWh
Scope 1 Emissions (Campus Vehicles)	23.15 tonnes CO_2-equivalent/year
Scope 2 Emissions (Electricity Use)	894.74 tonnes CO_2-equivalent/year
Total Annual Carbon Footprint	917.89 tonnes CO_2-equivalent/year
Campus Green & Plantation Area	3,173 m²
Smart Energy Systems Implementation Target	75% of buildings

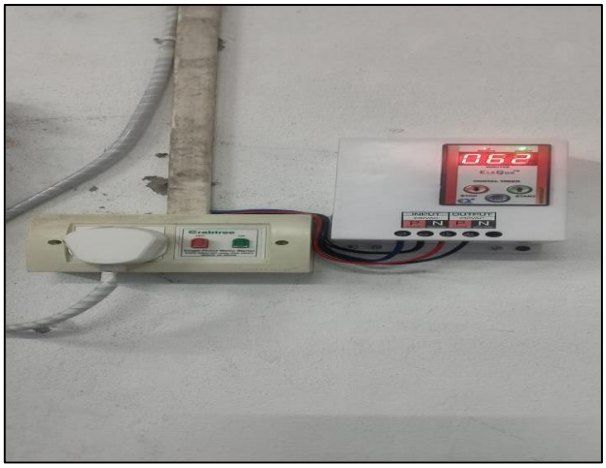
Challenges

- Integrating renewable energy sources such as rooftop solar into the existing campus grid poses challenges in maintaining voltage stability, demand-supply balance, and system flexibility. This requires advanced grid management and smart energy solutions to prevent curtailment and ensure reliable power supply.
- Initial investments and maintenance costs for renewable infrastructure, including solar panels, biogas plants, and smart devices, can be substantial. Budget constraints and technological upgrades need strategic planning.
- Renewable sources like solar and biogas suffer from intermittency and dependence on geographic and climatic conditions leading to variability in power generation. Achieving sustained energy conservation requires continuous awareness and behavioural change among campus users. Ensuring compliance with energy-saving practices is an ongoing challenge.
- Accurate quantification of carbon footprints and emissions across direct and indirect sources requires technical expertise and sophisticated monitoring tools.

Future Plans

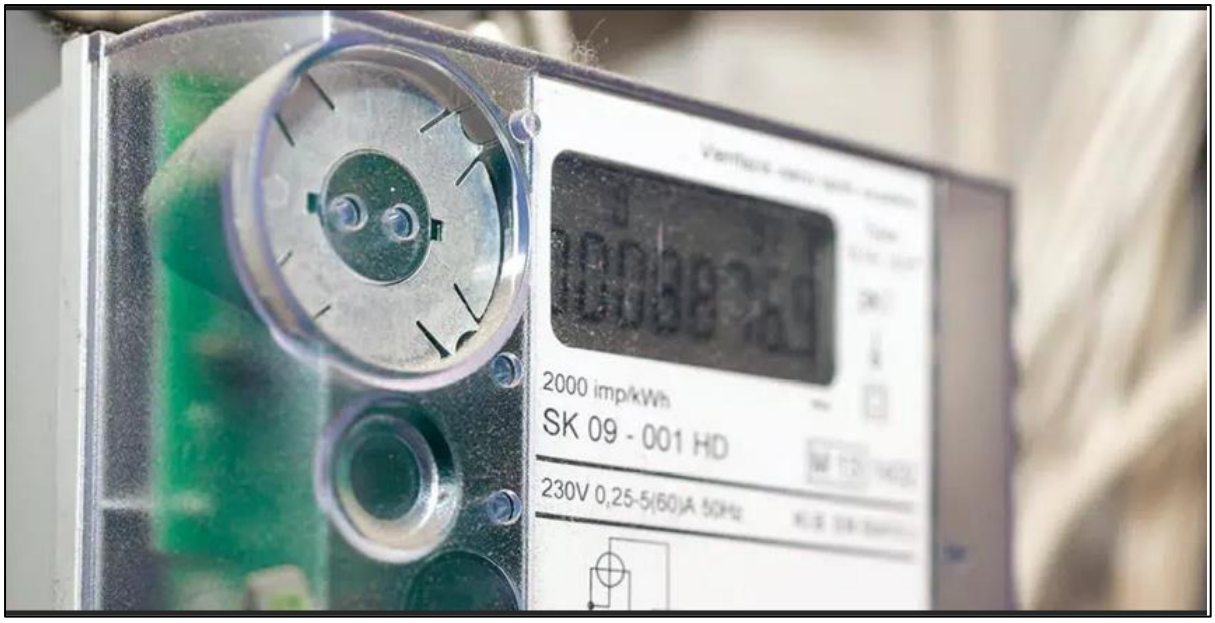
- Initiatives to increase capacity and efficiency of solar PV systems and operationalize biogas plants to diversify campus energy supply.
- Implementing integrated smart energy management solutions for load balancing, scheduling, and demand response to enhance grid stability and reduce operational costs.
- Promote electric vehicles and bicycle sharing with expanded infrastructure and incentives to reduce transportation emissions.
- Employ rainwater harvesting, greywater recycling, and comprehensive waste composting as part of campus-wide resource conservation efforts.
- Pursue further inter-institutional and industry partnerships for research commercialization, faculty and student development, and consultancy projects.
- Deploy improved techniques and tools for accurate carbon emission monitoring and aim for certified reduction targets.

Photo Gallery



3-Phase timer circuits for the Classrooms and Single-Phase timer circuits for the ACs have been connected in the classrooms so that the lights and ACs are not kept switched on even when there is no class going on and the electricity wastage is reduced thus saving electricity bills.

40 kW Grid-Connected Rooftop Solar Panels installed in IEM Newtown campus generating 320 kWh/day



Installation of Smart Meters