

## SDG 7: CLEAN AND AFFORDABLE ENERGY

Leader: Assam Don Bosco University (ADBU), India

<https://www.dbuniversity.ac.in/>

### **Satellites in Subcluster:**

- Qatar University, Qatar
- Strathmore University, Kenya



### **SDG 7 Cluster Overview**

Energy continues to be one of the foundational enablers of human development, influencing health, education, industry, and environmental sustainability. At Assam Don Bosco University, we remain committed to ensuring access to clean, reliable, and affordable energy for all. We recognize that sustainable energy is not only a technological or economic issue but also a social imperative that demands inclusive participation and innovative solutions. Building on our ongoing efforts, we have enhanced our clean energy initiatives through expanded training programs in solar energy, with a special emphasis on skill development for rural youth and emerging professionals. These programs provide practical, hands-on learning experiences that empower participants to contribute meaningfully to the energy transition.

Our research continues to explore integrated solutions aimed at improving energy efficiency, promoting circular resource use, and developing scalable models of clean energy generation. We actively promote sustainable practices across our campus operations, encouraging a culture of responsible consumption and innovation. By fostering collaboration among academia, industry, government, and community stakeholders, the University serves as a platform for shared learning and impactful action. The following activities highlight our continued dedication to advancing the goals of Sustainable Development Goal 7.

### **Activity 1: Swabalamban: Empowering Employment through Solar Energy.**

The "Swabalamban Initiative: Empowering Employment through Solar Energy" under the Swajanita Programme was held at Assam Don Bosco University's Azara campus. The initiative, conducted in Assamese language, aimed to boost youth employability by providing hands-on training in solar energy technology and electrical house wiring. Participants learned about solar system installation, maintenance, and electrical wiring, acquiring skills for self-employment. The program helped them gain practical knowledge in the renewable energy sector. By the end of the training, the participants were equipped to pursue opportunities in solar energy installation and maintenance. This initiative aimed to promote sustainable livelihoods in the community.







**ACTIVITY 2:** International Conference ICEESRE-2024: Pioneering Progress in Environmental and Energy Research in North East India.

The International Conference on Emerging and Environment Sustaining Renewable Energy (ICEESRE-2024) held on October 24-25, 2024, at Assam Don Bosco University (ADBU) marked a significant milestone in the landscape of environmental and energy research in North East India. With ADBU recognized by the International Association of Universities (IAU) as a global cluster lead for Sustainable Development Goal 7 (SDG-7), the university's Department of Electrical and Electronics Engineering organized this prestigious event under the theme "Access to Affordable, Reliable, and Modern Energy Services for All". This collaborative venture, supported by India's Science and Engineering Research Board (SERB), saw five prestigious Taiwanese universities- Cheng Shiu University, National Quemoy University, National Chung Cheng University, Kung Shan University, and Fu Jen Catholic University - join hands with ADBU in advancing sustainable energy innovation.



**Activity 3:** The Department of Electrical and Electronics Engineering at ADBU Hosts Engaging Seminar on Machine Learning for Sustainable Energy.

The Department of Electrical and Electronics Engineering (EEE) at Assam Don Bosco University (ADBU), School of Technology, organized a seminar on January 8, 2025, titled “Machine Learning in EEE for Sustainability: Basics to Current Trends”. The event supported the Vikshit Bharat @2047 Mission and the UN’s Sustainable Development Goal 7 (SDG-7), which promotes affordable and sustainable energy for all.

The resource person, Prof. Tirumala Krishna Battula from the Department of Electronics and Communication Engineering at JNTUK, Andhra Pradesh, and Director of the IIIP & T Cell, delivered an insightful session. He explored how machine learning (ML) can revolutionize energy systems and contribute to sustainability.

Prof. Battula covered ML basics, workflows, and applications in EEE, including supervised, unsupervised, and reinforcement learning. He highlighted tools such as Python libraries (TensorFlow, Scikit-learn) and MATLAB, and addressed challenges like data preprocessing and algorithm selection. Emerging trends like deep learning for sustainable energy were also discussed.

An interactive Q&A session allowed participants to explore implementation challenges and career prospects in ML and EEE. The seminar was attended by 30 students, faculty, and staff, who appreciated the engaging and informative format. The program concluded with a vote of thanks, reinforcing ADBU’s commitment to sustainability and innovation.



**Activity 4:** The Department of Electrical and Electronics Engineering of ADBU Hosts Seminar on Power System Substations, Driving Sustainable Energy Goals.

The Department of Electrical and Electronics Engineering (EEE) at Assam Don Bosco University (ADBU) organized a seminar on “Power System Substations: Fundamentals, Protection, and Future Trends” on February 5, 2025. The event aligned with the United Nations’ Sustainable Development Goal 7 (SDG-7) and India’s Viksit Bharat@2047 mission, aiming to enhance understanding of substation technology and its role in sustainable energy systems.

Mr. Narayan Sarma, former General Manager of Assam Electricity Grid Corporation Limited (AEGCL), served as the resource person. A respected expert in substation technology, Mr. Sarma shared his practical insights from decades of experience in the installation, testing, and commissioning of 220 KV and 132 KV substations.

Attended by 63 students, faculty, and staff, the session covered key substation components such as busbars, transformers, isolators, circuit breakers, CTs, and PTs. Mr. Sarma discussed different substation types, from step-up substations at generation sites to local distribution substations. He also explained system functions including protection, fault detection, energy control, and stability maintenance.

A major focus was placed on various circuit breakers (oil, air blast, SF6, vacuum), their functions, and safety mechanisms like lightning arrestors. Topics such as earthing, shielding, and essential auxiliary systems (illumination, firefighting) were also addressed.

The seminar offered participants a deep understanding of modern substation systems and their role in building a reliable, sustainable power infrastructure. ADBU continues to contribute meaningfully to national and global energy goals by fostering technical knowledge and skill development among future engineers.





**Activity 5: Research Collaboration on GaN for Space-Based Solar Power.**

Chang Gung University, Taiwan, and Assam Don Bosco University (ADBU), India, have initiated a joint research project focused on Gallium Nitride (GaN) technology for space-based solar power transmission. The collaboration explores the use of GaN's high-frequency and thermal efficiency to enable wireless energy transfer from low Earth orbit (LEO) satellites to ground-based receivers. This cutting-edge research aims to revolutionize global energy access by harvesting solar power in space uninterrupted by weather or day-night cycles and transmitting it to Earth. Aligned with the United Nations' Sustainable Development Goal 7 (SDG-7), the project envisions delivering clean, reliable, and sustainable energy, particularly to remote and underserved regions. By combining expertise in space technology and advanced semiconductors, the partnership fosters innovation that could redefine the future of renewable energy infrastructure worldwide.



#### **Activity 6:** Research Collaboration on Implementation of SDGs in Assam Don Bosco University

Assam Don Bosco University and UNESCO Chair on Global Understanding for Sustainability, Friedrich Schiller University Jena Germany have signed an MoU for implementation of SDGs in the Assam Don Bosco University campus related to nutritious, sustainable food in the campus kitchen garden and fruit forest (SDG2), waste management of grey and black water as well as hazardous effluents in the campus (SDG6), eco-friendly sustainable mobility in campus (SDG7), green and energy efficient campus infrastructure (SDG11), water management in everyday life (SDG6) and agroforestry (SDG15), harnessing of and use of clean and green renewable energy (SDG7), skill enhancement and livelihood development of neighborhood communities (SDG1). The SIELWARM Project (Sustainable development goals on Integrated Energy Land Water and Air Resource management) based on the 'Living Laboratory' campus concept by which Campus resources and data are harnessed for teaching and applied research on sustainability solutions developed by students for addressing problems of the campus community (SDG4) is supported by the UNESCO Chair on Global Understanding for Sustainability, Friedrich Schiller University Jena Germany aligned with The JENA DECLARATION with certification to students who work on the SIELWARM Project.

## **JOURNAL PUBLICATIONS:**

### **1. QoS Aspects of Loosely Coupled Microservices for Solar PV Power Estimation**

DOI: <https://iopscience.iop.org/article/10.1088/1742-6596/2957/1/012014/meta>

Deployment of Computational physics through the paradigm of loosely coupled microservices can play a vital role for parallel computing that can be utilized for estimation of solar PV power. As such we propose to deploy a novel model that can be used to perform different computational logic for the domain of physics. We call this model as MicroComPhy (Microservice for Computational Physics). In our prototype deployment, we estimate the amount of solar photovoltaic power generation using three mathematical equations: (a) current generation; (b) junction thermal voltage measurement; and (c) nominal operating cell temperature (NOCT) measurement. The development and deployment of a Spring Boot application using the Apache Tomcat server provides the platform for the evaluation of parallel computing using the microservice architecture design pattern. The quality of the service is observed using different correlation of system performance metrics. The experimental setup, the quality observation and

### **2. Design and Development of IoT-Enabled Solar-Powered Waste Bin with Optimal Routing**

DOI: <https://doi.org/10.1007/s41403-024-00507-1>

Waste management is crucial for minimizing environmental impact and improving public health. Each day, a substantial amount of waste is produced through different activities. Although simple, traditional waste collection methods often face challenges such as inefficient routing, unpredictable bin fill levels, and high operational costs. Therefore, there is a need for smart and sustainable waste monitoring and collection systems. This paper presents a smart waste monitoring and collection system that integrates IoT technology, renewable energy sources, and optimal routing algorithms. An innovative integrated smart waste bin and street light assembly is proposed to mitigate the sensor placement issues while also providing additional functionality for area illumination for safety and convenience. The bins are prioritized based on the sensor values, and a collection schedule is prepared. Heuristic algorithms are employed to determine the optimal tour for waste collection. A hardware prototype of the integrated smart waste bin and street light assembly was developed and tested. Simulations are run on virtually placed waste bins in an actual urban environment to test the developed algorithm. The results highlight the system's capability to offer a sustainable solution to modern waste management challenges.



## **BOOK / BOOK CHAPTER**

### **Python for Electrical and Electronics Engineering**

This extensive guide offers a thorough introduction to Python's many applications in the field and is intended for both aspiring engineers and experienced professionals. Examine how Python makes difficult tasks like data analysis, and test equipment automation easier. This book gives readers the tools they need to tackle real-world engineering problems, from electrical data processing to solar PV (Photovoltaics) module assessment. To ensure that readers not only comprehended the concepts but also obtain practical experience, each chapter combines the theory with real-life examples. This book will help you automate testing procedures and create control systems for different data engineering applications in Electrical and Electronics Engineering.