Centurion University
Shaping Lives...
Empowering Communities...

Industry Engagement and Technical Services for Energy Efficiency and Clean Energy Adoption

Industry Services for Energy Efficiency and Clean Energy (2025)

Centurion University of Technology and Management supports local industries, MSMEs, agricultural enterprises and rural communities through technical consultancy, renewable energy demonstrations, industrial automation training, capacity-building programmes and collaborative research. Its initiatives include solar-powered dryers and irrigation systems, agrivoltaic demonstrations, smart energy monitoring, and the Schneider Electric–supported Smart Energy and Automation Laboratory. The University also promotes clean-energy technology development through patents, student-led innovations and industry–academia partnerships.

Industrial Services and Collaborations

In 2025, Centurion University expanded its industry engagement through collaborative research, technical consultancy, capacity-building programs, and clean energy demonstration projects. The University worked closely with MSMEs, manufacturing units, agricultural enterprises, rural communities, and public institutions to improve energy efficiency, promote renewable energy technologies, and build technical competencies for sustainable production systems.

The University's clean energy initiatives included:

- Technical support for rooftop solar photovoltaic systems and decentralized renewable energy solutions.
- Demonstration of agrivoltaic systems, solar-powered irrigation, solar dryers, solar cold storage, and hybrid renewable energy technologies for rural enterprises.
- Capacity-building and skill development programs on clean energy technologies, green manufacturing, electric mobility, and sustainable industrial practices.
- Collaborative research and field demonstrations under national and international partnerships, including projects supported by Indian Council of Social Science Research (ICSSR), Bharat Rural Livelihoods Foundation (BRLF), L&T Infotech and Mindtree (LTIMindtree), etc. and other development partners.
- Industry-oriented training through experiential learning centers, enabling students and professionals to acquire practical skills in renewable energy installation, operation, maintenance, and energy-efficient technologies.
- Technical consultancy and knowledge dissemination to support MSMEs, entrepreneurs, and local communities in adopting low-carbon technologies and improving resource efficiency.

These collaborative initiatives strengthened technology transfer, enhanced industrial competitiveness, reduced environmental impacts, and supported the University's vision of creating sustainable livelihoods through clean energy innovation and industry-academia partnerships.

Initiative / Activity	Sector	Service Provided	Outcome (2025)
Schneider Electric–Supported Electrical & Automation Lab	Manufacturing & Electrical	Industrial automation, energy audit, and smart grid training	350+ students and 50+ local technicians trained annually
Solar-Powered Storage & Hybrid Dryer Systems	Agro-processing	Design, patenting, and deployment of solar-powered storage and hybrid dryers	65+ rural producers trained; 30% reduction in post-harvest energy cost
Solar-Operated Drip Irrigation & Agri-Voltaic Demonstrations	Agriculture	Energy audits, IoT-based renewable integration for irrigation	25% improvement in irrigation efficiency, 1.7 LER achieved
Smart Microgrid Pilot (IoT-based)	Rural electrification	Real-time monitoring, load management, and renewable integration	16% grid load reduction in pilot campus

Patented Clean Energy Technologies

Centurion University's innovation ecosystem has generated patented, field-deployable technologies that are shared with industry and rural entrepreneurs to promote sustainable energy solutions.

Key Patents (2025–26):

- **Development of a Self-Sustaining Green Building Design** — Integrates passive cooling, rooftop solar PV, rainwater harvesting, and natural ventilation to reduce building energy demand, while improving water conservation and indoor thermal comfort.
- **Alphabets in Drone: Manual UAV Control System** — Alphabet-based drone navigation using programmable flight control and wireless communication, enabling intuitive UAV operation for education, surveillance, and precision applications.
- **Solar-Powered Agriculture E-Vehicle** — Solar-assisted electric agricultural vehicle with BLDC motor and battery management system, providing **zero-emission farm transportation** while reducing fuel consumption and operating costs.
- **Solar-Powered Seed Planter for Sustainable Agriculture** — Solar-powered precision planter with automated seed metering and adjustable sowing depth, improving planting accuracy while eliminating fossil fuel dependency.
- **Renewable Energy Resources in Distributed Power Networks** — Smart distributed energy management system integrating solar PV, battery storage, and intelligent grid synchronization to enhance power reliability and renewable energy utilization.
- **Renewable Energy-Based Sustainable Transportation System** — Clean mobility platform integrating solar-assisted charging, electric propulsion, regenerative braking, and intelligent energy management for low-carbon transportation.
- **Agriculture Drone for Spraying Nutrients** — GPS-enabled precision spraying drone with variable-rate nutrient application, reducing chemical wastage, labour requirements, and improving crop productivity through targeted aerial spraying.

These patented technologies exemplify Centurion University's transition from R&D to real-world renewable energy applications — a model for **university–industry collaboration** in achieving sustainable development.

Energy Efficiency through Research and Capacity Building

Centurion University actively supports industries through its Smart Campus and Research Innovation Framework, focusing on the following domains:

- **Energy Auditing:** Faculty–student teams conduct practical audits for small enterprises and campus facilities.
- **Technology Demonstration:** IoT-based dashboards showcase real-time monitoring and energy optimization.
- **Industry-Led Projects:** Collaborative R&D with Schneider Electric, Siemens, and OSDA.
- **Workshops and Training:** 25+ workshops conducted annually on renewable integration, smart automation, and industrial efficiency.

Training Highlights

- 250+ students trained on Solar Hybrid & DC Systems
- 300+ rural participants trained on solar irrigation and energy-efficient farming
- 50+ faculty and industry professionals engaged in renewable research collaborations

Impact Metrics (2025)

Parameter	2025 Value	Target 2030	Linked SDG Indicator
Installed Solar Capacity	1.40 MWp	2.0 MWp	7.2.1
Annual Energy Saved	1.65 GWh	2.0 GWh	7.3.1
CO_2 Emissions Avoided	1,650 tCO_2e/year	Net Zero by 2035	13.2.1
Renewable Energy Share	48%	80%	7.2.1
Industry Partners Engaged	15+	30+	9.5.1

Key Outcomes and Socio-Economic Impact

- **Increased energy efficiency** across 15+ demonstration units and community clusters
- **56.17% renewable share** achieved in institutional operations
- **Skill transfer to 270+ youth, SHG women, and technicians** for renewable adoption
- **Energy-efficient retrofits** in academic and hostel buildings (30% intensity reduction)
- **Sustainable livelihoods** created through clean-energy enterprises

Patents

1. Development of a Self-Sustaining Green Building Design Utilizing Passive Cooling, Solar Energy Harvesting, and Rainwater Harvesting Techniques

Dr. Nimay Chandra Giri, along with Priyanka Mishra, Damodar Jena, Suva Kanta Mohanty, and Rakesh Ranjan Thakur, developed an innovative self-sustaining green building design that integrates passive cooling, solar energy harvesting, and rainwater harvesting technologies to improve energy

efficiency and resource conservation. The invention was filed as a National Patent in India (Application No. 202531004196) on 18 January 2024 and was published on 31 January 2025. This innovation contributes to sustainable building practices by reducing energy consumption and promoting environmentally responsible infrastructure.

2. Alphabets in Drone: Methods for Manual Controlling of a Remote-Controlled Unmanned Aerial Vehicle

Dr. Nimay Chandra Giri, in collaboration with Vineeta Chandra, Sameer Mahapatro, Mousumi Mahapatro, Amrit Warshini, Aman Verma, P. Mounika, Vemu Sudham, and Agantika Gupta, developed an innovative manual control methodology for remote-controlled unmanned aerial vehicles titled "Alphabets in Drone." Filed as a National Patent in India (Application No. 202531003883) on 17 January 2024, the invention was published on 31 January 2025. The innovation enhances drone control mechanisms, offering potential applications in education, surveillance, and precision operations.

3. Solar Powered Agriculture E-Vehicle

Dr. Nimay Chandra Giri, together with Kadavakollu Kalyani Radha, Ramavat Ganapati, Beedalannagari Omprakash, Manoj Panchal, K. Sudha Madhuri, Sk Mohammad Shareef, Pradyumna Vishwakarma, and Upendra Rajak, developed a Solar Powered Agriculture E-Vehicle aimed at promoting sustainable agricultural transportation using renewable energy. The design was filed in India as a National Design Registration (Application No. 439389-001) on 3 December 2024 and was successfully registered on 11 February 2025. The innovation supports clean mobility and sustainable farming by reducing dependence on fossil fuels.

4. Solar-Powered Seed Planter for Sustainable Agriculture

Dr. Nimay Chandra Giri, along with Monika Ray, Kishore Chandra Sahoo, Sajeeb Kumar Biswasi, Sukumar Tudu, Satyaprakash Barik, and Sangram Kishore Routray, designed a Solar-Powered Seed Planter to improve energy-efficient and environmentally sustainable agricultural practices. The design was filed as a National Design Registration in India (Application No. 442116-001) on 26 December 2024 and was registered on 10 March 2025. This innovation demonstrates the application of renewable energy technologies to enhance agricultural productivity while minimizing environmental impacts.

5. Renewable Energy Resources in Distributed Power Networks

Dr. Nimay Chandra Giri, in collaboration with Damodar Jena, Priyanka Mishra, Rakesh Ranjan Thakur, Dillip Kumar Bera, Debabrata Nandi, Roshan Beuria, and Sima Das, developed an invention titled "Renewable Energy Resources in Distributed Power Networks." Filed as a National Patent in India (Application No. 202531031292) on 30 March 2025, the invention was published on 11 April 2025. The innovation focuses on integrating renewable energy resources into distributed power systems to improve energy efficiency, grid reliability, and sustainable electricity generation.

6. Renewable Energy Based Sustainable Transportation System

Dr. Nimay Chandra Giri, together with Priyanka Mishra, Damodar Jena, Rakesh Ranjan Thakur, Dillip Kumar Bera, Debabrata Nandi, and Roshan Beuria, developed a Renewable Energy Based Sustainable Transportation System that promotes the use of clean energy solutions in modern transportation. The design was filed as a National Design Registration in India (Application No. 454027-001) on 2 April 2025 and was registered on 9 July 2025. The innovation supports the transition towards low-carbon transportation systems and sustainable mobility.

7. Agriculture Drone for Spraying Nutrients

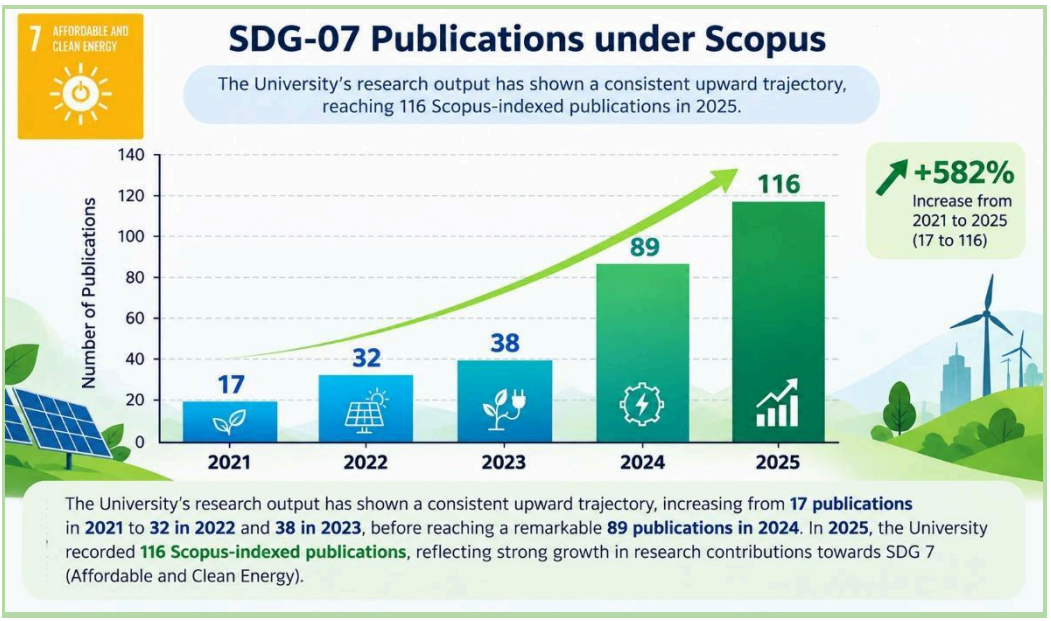
Dr. Nimay Chandra Giri, along with R. Sandhu, M. Attri, B. Krishna, K. K. Bansal, Bhart, V. Kumar, A. Kumar, and A. Kumar, developed an Agriculture Drone for Spraying Nutrients to improve precision agriculture through efficient nutrient application. The design was filed as a National Design Registration in India (Application No. 393534-001) on 24 August 2023 and was registered on 12 August 2025. This innovation enables precision farming by optimizing nutrient distribution, reducing input costs, and supporting sustainable agricultural practices through drone technology.

Student led Solar Dryer and Drip Irrigation

At Centurion University, student-led innovation and sustainable practices are integrated into real-world applications. Two solar dryer, designed and developed by B.Tech engineering students, is actively utilized in the university's food processing unit to dehydrate fruits, vegetables, and other food products. This eco-friendly solution leverages solar energy to ensure hygienic, energy-efficient, and cost-effective food preservation, reducing dependency on conventional drying methods and contributing to clean energy initiatives under SDG 7 and SDG 12. This system uses solar power to operate water pumps, ensuring efficient water use through targeted irrigation and minimizing water wastage. The initiative promotes green farming practices, educates students on renewable energy applications in agriculture, and serves as a live demonstration for local farmers on how to adopt solar-powered irrigation for improved productivity and environmental conservation. These efforts underscore Centurion University's commitment to integrated sustainability, innovation, and community outreach.

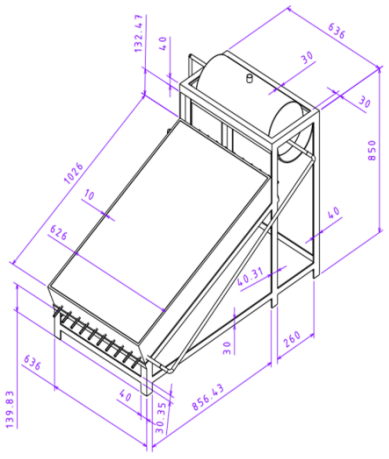
Academic Publications Toward SDG 7

Centurion University has demonstrated a strong and sustained commitment to advancing research in Affordable and Clean Energy (SDG7) through high-quality Scopus-indexed publications. The University's research output has shown a consistent upward trajectory, increasing from 17 publications in 2021 to 32 in 2022 and 38 in 2023, before reaching a remarkable 89 publications in 2024. In 2025, the University recorded 116 Scopus-indexed publications, reflecting its continued focus on renewable energy, energy efficiency, sustainable infrastructure, clean technologies, climate resilience, and low-carbon innovation. The University also has a substantial number of research manuscripts currently under review and in the publication pipeline across leading Scopus-indexed journals, indicating that the research output is expected to grow further in the coming months. This sustained publication trend highlights Centurion University's expanding research ecosystem, interdisciplinary collaborations, and unwavering commitment to generating impactful knowledge that supports the global clean energy transition and contributes to the achievement of United Nations Sustainable Development Goal 7 (Affordable and Clean Energy).



An Evacuated Solar Collector System for Efficient Water Heating

A Utility Patent has been published titled *"An Evacuated Solar Collector System for Efficient Water Heating"* (Application No. 202531079524), invented by DebashreeDebadattaBehera, Swarup Kumar Sahoo, Shiv Sankar Das, Pradeep Kumar Sahoo, Ramesh Chandra Mohanty, and Sujata Chakravarty. The invention introduces a cost-effective solar water heating system employing an optimized evacuated tube solar collector (ETSC) with copper absorber pipes and vacuum-sealed glass tubes to significantly reduce heat loss and improve thermal efficiency. The system integrates a transparent glazing cover, insulation layers, and a thermosyphon-enabled insulated tank, eliminating the need for pumps or controllers. Designed with low-cost, commercially available materials, it is well-suited for domestic and small-scale commercial applications. Experimental validation has demonstrated higher water outlet temperatures and better heat retention than conventional flat-plate collectors, making it a sustainable, scalable, and eco-friendly solution for water heating.



Auto CAD design for An Evacuated Solar Collector System

Schneider Electric–Supported Smart Energy and Automation Laboratory

Centurion University, in collaboration with Schneider Electric India Foundation, operates a state-of-the-art Smart Energy and Industrial Automation Laboratory that strengthens the University's Skill Integrated Higher Education (SIHE) model. The laboratory provides hands-on training in industrial automation, electrical systems, energy management, PLC programming, motor control, smart distribution systems, industrial wiring, and IoT-enabled automation. The facility bridges the gap

between classroom learning and industry requirements while preparing students for careers in Industry 4.0 and sustainable energy systems.

The Schneider Electric Lab is extensively utilized by students from Electrical Engineering, Electronics & Communication Engineering, Mechanical Engineering, Mechatronics, Diploma Engineering, and Skill Development programmes for academic learning, industrial training, certification, and applied research.

Student Learning and Practical Activities (2025)

Students actively participate in:

- Curriculum-integrated laboratory experiments on industrial electrical systems, motor control, PLCs, sensors, and automation.
- Project-Based Learning (PBL) involving smart energy management, industrial automation, electrical panel design, and IoT-based monitoring systems.
- Schneider Electric–certified skill programmes under NSDC and industry-integrated vocational frameworks.
- Hands-on workshops on smart energy management, industrial safety, electrical installation, building automation, and sustainable energy technologies.
- Industry simulations and field installations, including smart electrical panels, energy-efficient wiring systems, and automation projects within the university and surrounding communities.
- Internships and industry exposure through Schneider Electric-supported technical training and industrial engagement programmes.

Aspect	2025 Outcome
Skill Development	Over 500+ students trained annually in Domain courses, Schneider Electric-certified programmes covering industrial automation, PLCs, motor control, electrical installation, and energy management.
Industry Certifications	250+ students successfully completed industry-recognized certification programmes in electrical installation and industrial automation.
Innovation & Student Projects	More than 40 student-led projects developed on smart automation, IoT-based monitoring, energy-efficient electrical systems, and renewable energy integration.
Employability	Enhanced industry readiness with graduates securing placements in electrical, automation, renewable energy, manufacturing, and smart infrastructure sectors.
Industry Collaboration	Continuous curriculum enrichment, faculty training, technology upgradation, and industrial mentoring through Schneider Electric India Foundation.

Sustainability Education	Strengthened practical learning aligned with SDG 7 (Affordable & Clean Energy), SDG 9 (Industry, Innovation & Infrastructure), SDG 11 (Sustainable Cities & Communities), and SDG 13 (Climate Action) through smart energy and automation technologies.