SDG 7: Affordable and Clean Energy

Solar and biogas on campus, an external energy audit, energy events, research and clean-energy startups

INTRODUCTION

Energy for the campus and beyond

Sustainable Development Goal 7 calls for **access to affordable, reliable, sustainable and modern energy for all**. It rests on three connected ambitions: universal access to dependable energy services, a substantially larger share of renewable energy in the global energy mix, and a faster rate of improvement in energy efficiency. These are supported by international cooperation, research, and investment in clean energy infrastructure and technology. Because energy underpins education, health, industry and climate action, progress on this goal enables progress on almost every other.

Universities contribute to SDG 7 in three ways: through how they power and manage their own campuses, through the knowledge they create and teach, and through the people and ideas they send into the wider energy sector. SRM University-AP follows the goal in principle across all three. It treats clean energy generation and responsible energy use as part of campus operations, brings energy topics into teaching, industry exposure and research, and encourages students and young entrepreneurs to develop energy solutions. The sections that follow show how this commitment is put into practice.



Rooftop solar panels on multi-storey campus buildings (aerial view)



Solar panels on a campus building rooftop (aerial view)

HIGHLIGHTS

532 kW
rooftop solar PV capacity, grid-tied at the MV panel

6,22,714 kWh
solar energy generated, Apr 2024–Mar 2025

3.2 %
share of solar in total energy consumption

1,82,86,800 kWh
electricity consumed from the utility

1,91,69,459 kWh
total energy consumed (utility + diesel generator + solar)

13
energy conservation proposals identified by the audit

16,50,964 kWh
estimated annual energy saving if all proposals are adopted (9 % of electrical energy)

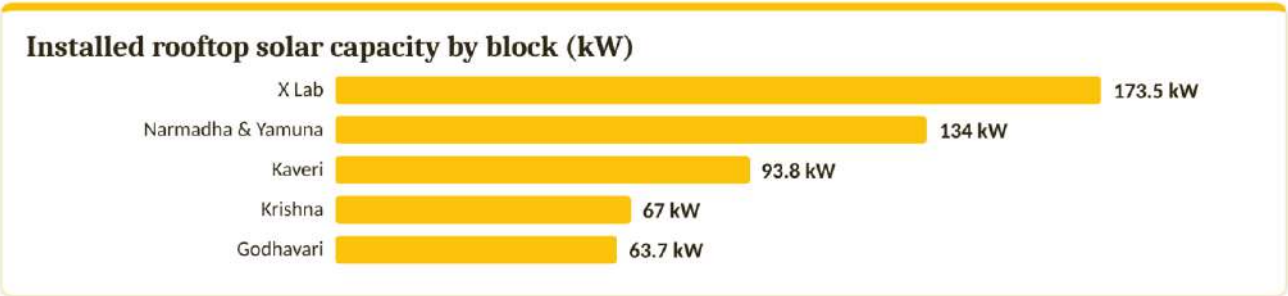
Rs. 170.0 Lakhs
estimated annual energy cost saving from the proposals

CAMPUS ENERGY

Solar, supply and consumption

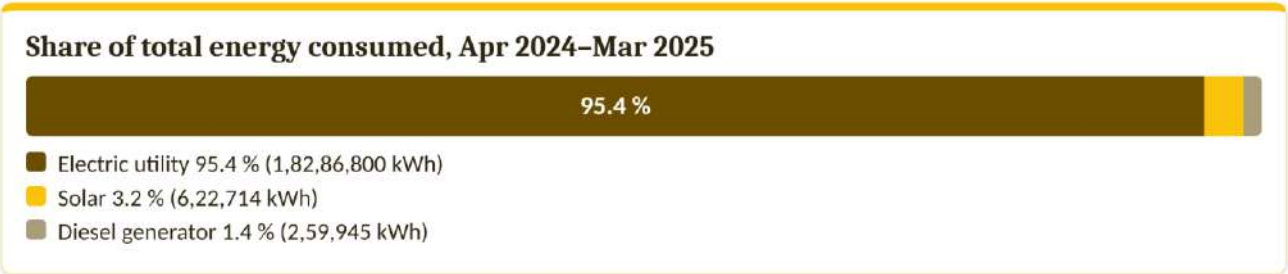
Rooftop solar PV installation

The campus runs a 532 kW rooftop solar photovoltaic plant on the roofs of most hostel and laboratory blocks, synchronised with the medium-voltage (MV) panel with separate metering. Capacity is spread over five blocks.



Solar generation is below the plant's design value, and regular panel cleaning and full use of the power generated are recommended.

WHERE CAMPUS ENERGY COMES FROM



Thermal energy is reported separately: LPG 1,43,070 kg (cooking) and diesel 3,35,502 litres, of which 78,980 litres for generators and 2,56,522 litres for transport.

WHEELING TO THE GRID



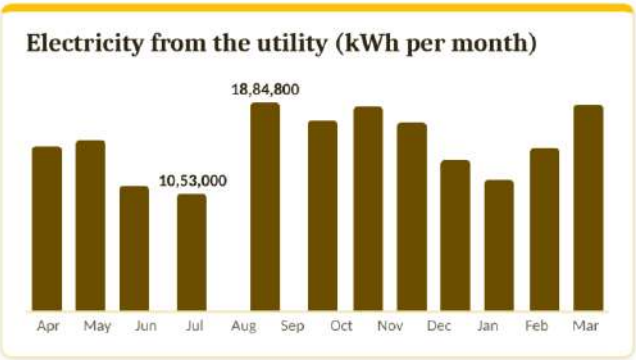
Wall-mounted electrical enclosures at the wheeling-to-grid site

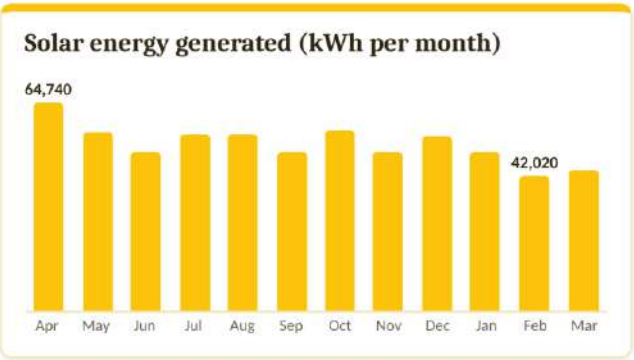


Electrical control panel with a glass-fronted meter window

CAMPUS ENERGY · MONTHLY PROFILE

Monthly energy profile, Apr 2024–Mar 2025





Consumption peaked in Aug-24 (18,84,800 kWh) and was lowest in Jul-24 (10,53,000 kWh). Solar generation was highest in Apr-24 (64,740 kWh) and lowest in Feb-25 (42,020 kWh).

ANNUAL ENERGY CONSUMPTION AND GENERATION, 2024–25

Month	Electricity (kWh)	Solar (kWh)	LPG (kg)	Diesel – DG (L)	Diesel – transport (L)	Diesel – total (L)
Apr-24	14,91,200	64,740	11,590	5,300	26,643	31,943
May-24	15,50,800	55,237	12,635	23,290	29,728	53,018
Jun-24	11,30,000	49,117	6,213	4,270	18,854	23,124
Jul-24	10,53,000	54,656	7,581	6,590	7,742	14,332
Aug-24	18,84,800	55,066	12,179	11,820	11,703	23,523
Sep-24	17,18,800	49,362	15,086	3,070	14,017	17,087
Oct-24	18,55,000	56,211	14,279	7,890	29,040	36,930
Nov-24	17,12,000	49,137	14,421	1,020	25,900	26,920
Dec-24	13,59,400	54,370	9,994	3,630	29,864	33,494
Jan-25	11,85,400	49,215	12,103	6,450	18,729	25,179
Feb-25	14,74,000	42,020	12,474	4,030	22,421	26,451
Mar-25	18,72,400	43,583	14,516	1,620	21,881	23,501
Total	**1,82,86,800**	**6,22,714**	**1,43,070**	**78,980**	**2,56,522**	**3,35,502**

Biogas for cooking

A biogas plant of nearly 6.0 m³ converts cooked rice, vegetable cuttings and unused vegetable waste from the mess and canteen into biogas through anaerobic digestion. The waste is crushed and mixed with water into a slurry before feeding. The gas is used to cook food in the Annapurani Mess.



Two workers carrying a blue crate of food waste



Gas burner with blue gas pipes in a kitchen area



Biogas plant building with a blue roof and mesh walls



Green dome-shaped cover beside a pile of dark material, outdoors

ENERGY AUDIT FINDINGS

What the external energy audit found

Data period: April 2024 to March 2025.

AUDIT AT A GLANCE

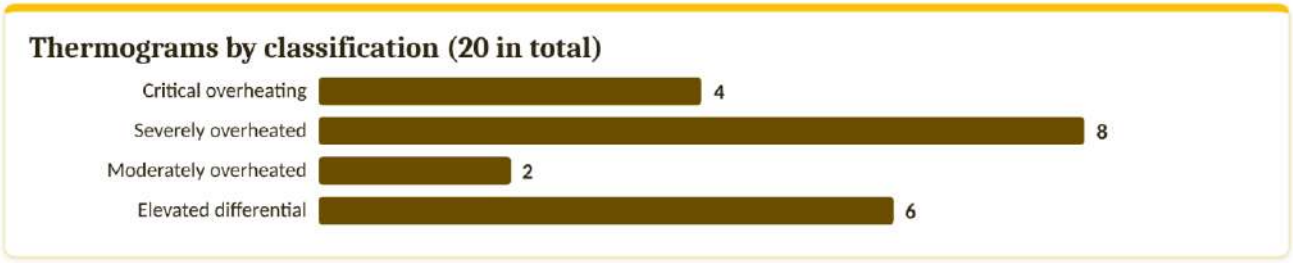
KEY OBSERVATIONS

Audited by	RAM-KALAM Centre for Energy Consultancy and Training, Coimbatore
Audit dates	30 June and 1, 2 & 3 July 2025
Scope	Electrical and thermal energy use: consumption pattern, 13 energy conservation proposals (ENCON), best operating practices, 24-hour measurements on two 2,000 kVA transformers, load-point measurements and infra-red thermography
Supply	Tariff 2A1; contracted demand 4,999 kVA; Rs. 6.95/kWh plus Rs. 475/kVA/month fixed charges
Electricity cost	Rs. 1,886.5 Lakhs for 1,82,86,800 kWh; average Rs. 10.28/kWh (taken as Rs. 10.30/kWh)
Backup power	Diesel generators of 2,000, 1,500 (two) and 1,000 kVA

- **Solar:** 532 kW plant generated 6,22,714 kWh (3.2 % of energy); the audit finds this lower than the design value (expected 6,38,400 kWh at 4.0 sun-hours/day for 300 days) and notes that monthly panel cleaning is already practised.
- **Power factor:** 0.99 to 1.00 in every month; recorded demand ranged from 2,744 to 4,447 kVA against 4,999 kVA contracted.
- **Fans and lighting:** most ceiling fans are BLDC (average 35 W per fan at maximum, a reduction of more than 50 %); all street lights are LED; indoor tube lights are being converted to LED in phases.
- **Air-conditioning:** all air-conditioned rooms are set at 24 °C per BEE norms; 48 of the 102 air handling units were running at audit.
- **Capacitors:** 709 kVAr of the 3,044.2 kVAr connected was found worn out and not injecting rated current.

Infra-red thermography

The audit team imaged transformers, panels, chillers and pump motors with a thermal imager at an ambient temperature of 29 °C and classified each reading. Of the 20 thermograms in the report, 4 are classed critical overheating, with chiller-panel incoming and transformer phase readings among those flagged for prompt attention.



BEST OPERATING PRACTICES RECOMMENDED

- Operate transformers near 50 % load; replace with IS-1180 star-rated units in future
- Test capacitors regularly; convert plain capacitors to reactor-coupled filters
- Install an Energy Management System (EMS) with online monitoring
- Fit digital energy meters on every building sub-board
- Replace remaining conventional fans with BLDC fans in phases
- Form a Green Energy Team of faculty and student volunteers
- Display monthly electricity use and cost in public areas
- Use cylinder tags to track LPG consumption

ENERGY CONSERVATION PROPOSALS

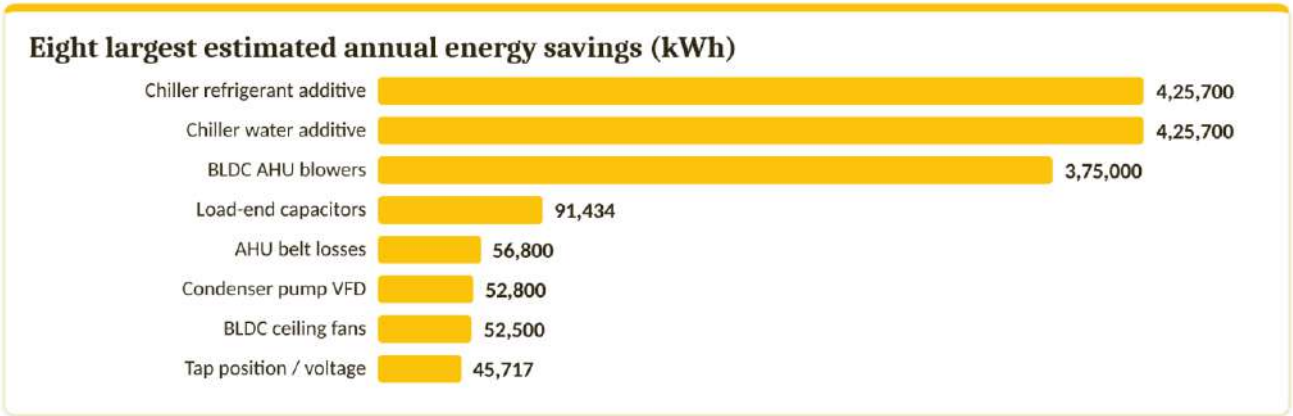
Thirteen steps to cut electricity use

The audit worked out 13 proposals. Together they could reduce annual electricity use from **1,82,86,800 kWh to 1,66,35,836 kWh**, a saving of **16,50,964 kWh (9 % of electrical energy)** and **Rs. 170.0 Lakhs** a year. Seven of the 13 need no investment or an investment under Rs. 7,00,000. All figures are annual estimates.

#	Proposed measure	Basis of saving	Energy saving (kWh)	Financial saving (Rs.)	Initial investment (Rs.)	Simple payback
1	Increasing the Energy Production from the Roof Top Solar PV System using regular Panel Cleaning Schedule	1 % on Solar Energy Generation	6,227	64,138	Zero Cost	Immediate
2	Energy Savings in the AHU Blowers using Condition Monitoring & Regular Filter Cleaning	2 % of AHU Energy Consumption	15,200	1,56,560	Zero Cost	Immediate
3	Ensure Maximum Power Generation from Solar PV Plant & Reduction of Active Energy Consumption from the EB Utility	Better Utilization of Solar Energy	15,686	1,61,566	Zero Cost	Immediate
4	Reduction of Active Energy Consumption & Self-loss on the Worn-out Capacitors in the Electrical Distribution Network	20 W/kVAr on Capacitor Power	42,600	4,38,780	2,80,000	0.6 Years
5	Energy Saving in Primary Pump by Converting the EE Pumps with Closed Loop VFD Automation	20 % on Primary Pump Consumption	45,600	4,69,680	6,00,000	1.3 Years
6	Reduction of Higher Input Line Voltage to Standard Value by Adjusting the Tap Position at the Secondary Side	0.25 % of Electrical Consumption	45,717	4,70,885	Zero Cost	Immediate
7	Replacement of Existing Conventional Ceiling Fans into EC BLDC Fans	50 % on Fans Load	52,500	5,40,750	9,00,000	1.7 Years
8	Energy Conservation through Closed Loop Common VFD Automation for Condenser Pumps in Utility I Water Cooled Chillers	20 % on Condenser Pump Consumption	52,800	5,43,840	4,00,000	0.74 Years
9	Reduction of Mechanical Transmission Losses in Belt Driven AHU Blowers & Condition Monitoring of the Belt Slippage Loss	12 % of Belt Driven AHU Blowers	56,800	5,85,040	6,80,000	1.2 Years
10	Reduction of Cable Losses and Active Power Consumption using Load End Capacitor Compensation (At DB Level)	1 % on Electrical Load	91,434	9,41,770	6,00,000	0.64 Years
11	Replacement of Conventional Blower Fans into Electronically Commutated BLDC Fans in the AHUs	40 % of Electrical Consumption	3,75,000	38,62,500	1,34,25,000	3.48 Years
12	Reduction of Energy Consumption in Chiller Units through Active Refrigerant Additive for Removing Oil Fouling	10 % of Chiller Consumption	4,25,700	43,84,710	–	–
13	Reduction of Energy Consumption in Chillers using Heat Transfer Water Additives in the Chilled Water System	10 % of Chiller Consumption	4,25,700	43,84,710	–	–
	Total		**16,50,964**	**1,70,04,929**	**–**	**–**

WHAT THE SAVINGS ADD UP TO

- Two chiller additive proposals each save 4,25,700 kWh, the largest single items.
- Replacing AHU blower fans with BLDC fans saves 3,75,000 kWh.
- Six proposals are rated Zero Cost with immediate payback.



EDUCATIONAL INITIATIVES AND EVENTS

Ten events across four departments

Ten SDG 7 events were held between July 2024 and April 2025: six talks, workshops and demonstrations and four industrial visits.

10
SDG 7 events: 6 talks, workshops and demonstrations and 4 industrial visits

4
departments: EEE, ECE, Mechanical Engineering and Environmental Science and Engineering

Rs. 1,25,000
external funding for the 5-day Skill Enhancement Programme

Jul 2024–Apr 2025
period covered by the events

WORKSHOPS, EXPERT TALKS AND DEMONSTRATIONS

Skill Enhancement Programme on Renewable Energy and Smart Transportation

Department of Electrical and Electronics Engineering
22–26 Jul 2024 (5 days) · Participants 10–12 external, 21 PhD scholars, 4 UG

A hybrid five-day programme for faculty, PhD scholars and PG students with sessions on advanced power converters, microgrid operation through real-time simulation, charging infrastructure and battery state-of-charge estimation, renewable-source control and grid integration, and bidirectional power conversion for energy storage. Resource persons came from IIT Hyderabad, NIT Warangal and industry.


Participants seated at computers in a hall during a session


A presentation slide on screen with participants at workstations


Participants at computer workstations facing a projected screen


Participants and a speaker at a projected screen in a computer lab

AMPTS III Instrument Demonstration

Department of Environmental Science and Engineering
13 Sep 2024 · Participants 12 (3 faculty, 5 PhD, 4 PG)

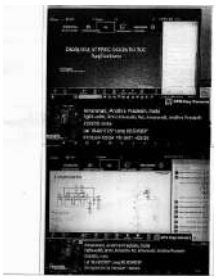
A demonstration of the Automatic Methane Potential Test System for researchers, showing how biogas and methane potential are measured, how retention times are optimised and how different biomass substrates perform in anaerobic fermentation.


Participants standing in a laboratory beside bench-top equipment

Design of Power Management Integrated Circuits (PMICs) for SoC Applications

Department of Electronics and Communication Engineering
1 Dec 2024 (online) · Participants 40 (4 faculty, 14 PhD, 22 UG)

A guest lecture on designing PMICs for system-on-chip applications covering voltage regulation, power sequencing, dynamic power management and energy efficiency across multiple power domains.



Screenshots of the online session showing slides on PMIC blocks for SoC and LDO compensation

Hydrogen Gas as the Future Fuel for Sustainable Power Generation

Department of Mechanical Engineering
24 Feb 2025

An invited talk by Prof. P. S. Robi (IIT Guwahati) on hydrogen as a fuel for sustainable power generation and the use of machine learning to model hydrogen generation by chemical reactions. It addressed high production costs, storage limitations and research collaboration among academia, industry and policymakers.



Speaker presenting at a screen to participants seated at computers



Participants seated around a table in a seminar room

Battery Modeling – Talk under the Power and Control Club

Department of Electrical and Electronics Engineering
26 Mar 2025 · Participants 24 (UG)

A talk by Dr Satyavir Singh on battery parameter and capacity estimation: equivalent-circuit and data-driven models, state of charge and state of health, and their use in battery management systems for electric vehicles and renewable energy storage.



Group photograph of participants standing in a laboratory space

Active Power Decoupling Integrated Switched Boost Inverter

Department of Electrical and Electronics Engineering
4 Apr 2025 · Participants 23 (3 faculty, 14 PhD, 6 UG)

A guest lecture by Dr Ravindranath Adda (IIT Guwahati) on reducing low-frequency ripple, improving power density and efficiency, and grid-connected applications of the switched boost inverter in renewable energy systems.



Participants seated around a conference table



Lecture room with a projected screen and participants seated at a long table

WHY THESE SESSIONS MATTER FOR SDG 7

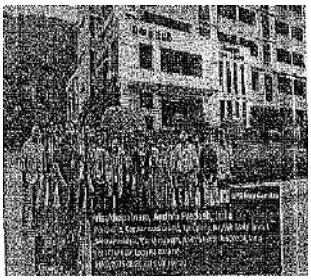
The sessions span the energy chain from generation and storage (hydrogen, batteries, biogas measurement) to power electronics and grid integration, giving faculty, research scholars and undergraduates direct access to current methods and practitioners.

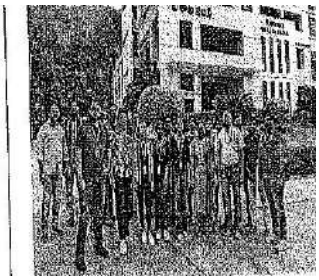
INDUSTRIAL VISITS

Industrial Visit to Bhabha Atomic Research Centre (BARC)

Department of Electrical and Electronics Engineering
20–21 Feb 2025 (2 days) · Participants 31 (2 faculty, 2 staff, 5 PhD, 22 UG)

Students visited a 192/11 kV substation, the research reactor facilities, a pulse power laboratory for plasma generation, and the control room and high-end computing facilities, learning about nuclear science and its role in the country's energy sector.


Participants standing outdoors in front of a multi-storey building


Group of participants standing outdoors

Industrial Visit: Thermal Power Station, Vijayawada

Department of Mechanical Engineering
12 Mar 2025 · Participants 32 (2 faculty, 2 PG, 28 UG)

Students observed boiler operations, turbine functioning, coal handling and environmental management, including ash handling and flue gas desulfurization, and spoke with plant engineers about efficiency and sustainability measures.



Group wearing safety helmets standing in an industrial area



Group standing in front of a parked vehicle among trees

Industrial Visit: Reliance Industries KGD6 Oil & Gas, Andhra Pradesh

Department of Mechanical Engineering
22 Mar 2025 · Participants 21 (5 faculty, 1 PG, 15 UG)

A visit to observe offshore and onshore oil and gas production, including floating production storage and offloading systems, wellhead platforms, gas separation units and safety and environmental practices, with discussion of career opportunities in the sector.



Group of visitors posing together outdoors



Three people standing before a Reliance KG D6 signboard

Thermal Power Plant Overview and Plant Visit, Dr. NTTPS, Ibrahimpatnam

Department of Electrical and Electronics Engineering
2 Apr 2025 · Participants 32 (2 faculty, 30 UG)

Students studied power plant layout, equipment ratings, boiler, turbine, exciter and turbo-alternator with its control centre, and saw the 220 kV grid interconnection with a 400 kV substation, linking theory to practical power generation.



Group standing in front of a building with a training institute signboard



Group members wearing safety helmets

COMMUNITY OUTREACH ACTIVITIES

Taking energy ideas beyond the campus

2
outreach activities, Nov–Dec 2024

360
participants at ChemZeal 3, of whom 315 were external visitors

41
participants at the Nellore training, of whom 33 were external

ChemZeal 3 – "Embark on an Exciting Journey into the World of Chemistry"

Department of Chemistry · APJ Abdul Kalam Auditorium
30 Nov 2024 · Participants 360 (315 external, 22 faculty, 17 PhD, 6 PG)

An annual day-long outreach event that brought school and college students to the campus for science demonstrations, an exhibition of experiments and lab tours. Its keynote, **"How Chemistry Helps to Generate and Store Clean Energy"** by Prof. Vijayamohanan Pillai, traced the shift from conventional to sustainable energy and covered rechargeable lithium-ion and sodium-ion batteries and the role of hydrogen. A second talk by an industry researcher in energy storage discussed careers in the field.

The department described the event as drawing a huge positive response from both students and teachers, and plans to continue it in the years to come.



Invited speaker addressing the auditorium beside seated guests



A senior speaker at an exhibition poster, with students gathered around



Two students in lab coats presenting an exhibition poster



Large group of participants seated on a tiered auditorium staircase

Training of Rural Women Entrepreneurs, Nellore – CSR ADITRI

Directorate of Entrepreneurship & Innovation "CSR ADITRI Team" · Nellore, Andhra Pradesh
29 Dec 2024 · Participants 41 (33 external, 8 staff)

An offline training session, 10:00 AM to 5:00 PM, for women entrepreneurs selected from earlier bootcamps under the CSR ADITRI project. It gave advanced training in **operating solar drying units** alongside sanitary pad manufacturing, with the aim of building technical skills, business management insight and sustainable, eco-friendly production practices.

Participants gained practical skills in running solar drying units and in manufacturing, supporting sustainable income generation and improved access to affordable sanitary products in rural communities.



Women participants seated under a shaded shelter listening to a speaker



Women participants seated in rows under a shaded shelter

RESEARCH AND PUBLICATIONS

SDG 7 research output, 2024–2025

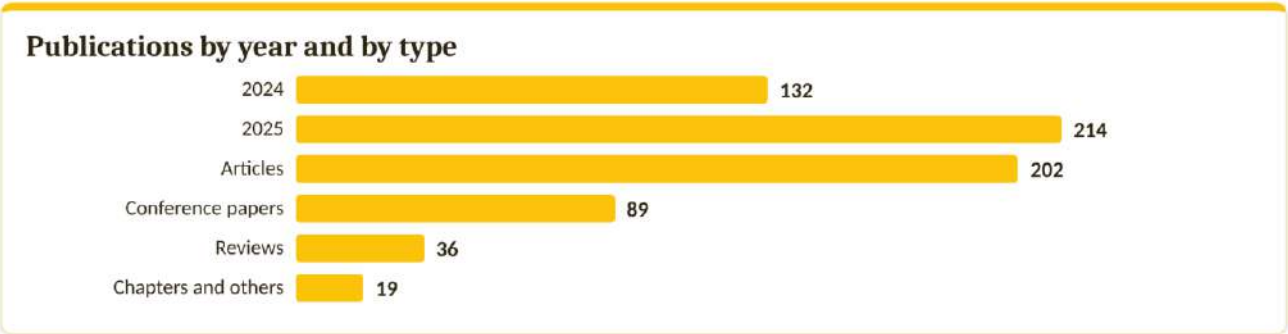
346
SDG 7 publications, 2024–2025

132
published in 2024

214
published in 2025

202
journal articles, with 36 reviews and 89 conference papers

SRM University-AP researchers published 346 documents in the SDG 7 category over 2024 and 2025. They cover hydrogen production and storage, solar photovoltaics, batteries and energy storage, microgrids and power electronics, and bioenergy. By type: 202 articles, 89 conference papers, 36 reviews, 17 book chapters, 1 book and 1 editorial.



SELECTED PUBLICATIONS

The twelve papers below were selected for their direct relevance to clean energy, with preference to those in high-percentile journals. A lower percentile number means a higher-ranked journal.

Year	Title and first author	Theme	Type	CiteScore	Percentile	FWCI	DOI
2024	**Direct Electroplating Ruthenium Precursor on the Surface Oxidized Nickel Foam for Efficient and Stable Bifunctional Alkaline Water ElectrolysisLi, C. et al.**	Hydrogen	Article	39.4	1	7.86	10.1002/adma.202403151
2024	**Spray cooling for hydrogen vehicle, electronic devices, solar and building (low temperature) applications: A state-of-art reviewGaneshKumar, P. et al.**	Hydrogen / Solar	Review	38	2	1.78	10.1016/j.rser.2023.113931
2024	**Emerging trends in cooling technologies for photovoltaic systemsMariam, E. et al.**	Solar PV	Review	38	2	1.64	10.1016/j.rser.2023.114203
2025	**Advancements in biomass waste conversion to sustainable biofuels via gasificationJoshua Abioye, K. et al.**	Bioenergy	Review	19.6	4	5.01	10.1016/j.cej.2024.159151
2025	**Green ammonia as hydrogen carrier: current status, barriers, and strategies to achieve sustainable development goalsVigneswaran, V.S. et al.**	Hydrogen	Review	18.8	5	2.39	10.1016/j.scitotenv.2025.179646
2024	**Framework for strategic deployment of hybrid offshore solar and wind power plants: A case study of IndiaLuhaniwal, J. et al.**	Solar / Wind	Article	20.7	2	1.67	10.1016/j.jclepro.2024.144009
2024	**Thermographic inspections of solar photovoltaic plants in India using Unmanned Aerial Vehicles: Analysing the gap between theory and practicePuppala, H. et al.**	Solar PV	Article	17.6	2	0.31	10.1016/j.renene.2024.121694
2024	**Anion-Exchange Membrane Water Electrolyzers for Green Hydrogen Generation: Advancement and Challenges for Industrial ApplicationGhorui, U.K. et al.**	Hydrogen	Review	10.2	10	1.8	10.1021/acsaem.4c01585
2024	**Potential Benefits, Challenges and Perspectives of Various Methods and Materials Used for Hydrogen StoragePanigrahi, P.K. et al.**	Hydrogen	Review	9.5	14	3.82	10.1021/acs.energyfuels.3c04084
2025	**Exploring the Potential and Roadblocks of Marketable Energy-Storage Technologies for Renewable EnergySrivastava, M. et al.**	Energy storage	Review	6.5	32	1.12	10.1002/ente.202402405
2024	**A novel multi-port high-gain bidirectional DC–DC converter for energy storage system integration with DC microgridsVijayan, M. et al.**	Microgrids	Article	13.3	6	2.21	10.1016/j.est.2024.111431

Year	Title and first author	Theme	Type	CiteScore	Percentile	FWCI	DOI
2025	**Assessing Progress Toward SDG 7: A Threshold Analysis of Environmental Policy Stringency and Institutional Quality on Renewable Energy ConsumptionBadmus, J.O. et al.**	Energy policy	Article	13.6	2	1.23	10.1002/sd.70044

STARTUPS AND INNOVATION

Clean-energy startups under incubation

3
startups, all with SDG 7 as the primary SDG (incubation May 2024 – Jan 2026)

2
founded by students (GREEN X and VOLTA)

1
externally founded company (Vindra Renewables Private Limited)

Nil
funding or revenue reported by any of the three

GREEN X

Partnering with industries and communities to provide cost-effective renewable energy solutions while offering investors monthly returns on their investments.

Sector	Renewable energy solutions
Founder	Mr. Srinivas Reddy (student)
Registration	Under process
Incubation	17.05.2024 to 17.11.2025
Duration	–
Funding / revenue	Nil
Patents	Nil

Vindra Renewables Private Limited

Manufacturing of solar panels, batteries and related products.

Sector	Renewables
Founder	Mr. Vishnu Raj (external)
Registration	Pvt Ltd, incorporated 12 Aug 2020
Incubation	19.06.2024 to 19.06.2025
Duration	365 days
Funding / revenue	Nil
Patents	Nil

VOLTA

Working on EV batteries and hydrogen fuel cells.

Sector	Manufacturing
Founder	Mr. Harsha (student)
Registration	Under process
Incubation	23.01.2025 to 23.01.2026
Duration	365 days
Funding / revenue	Nil
Patents filed	–

CONCLUSION

Progress towards affordable and clean energy

SRM University-AP's work on SDG 7 runs through its campus, classrooms, research and community. The 532 kW rooftop solar plant and the biogas system supply clean energy on campus, while an external energy audit has measured where the university's electricity goes and set out 13 concrete steps that could cut annual electricity use by 9 %. The audit also shows where the next gains lie: raising solar output towards its design value and acting on the thermography and capacitor findings.

Beyond the campus, ten events brought experts and industrial sites to students and researchers, two outreach activities carried energy ideas to school students and rural women entrepreneurs, 346 publications added to the energy literature, and three startups are working on renewables, batteries and hydrogen fuel cells. The priorities ahead are to record the output of the biogas and wheeling systems, to implement the audit's proposals, and to report energy data on a single consistent basis each year.