Shoolini University

7 AFFORDABLE AND CLEAN ENERGY

Energy-efficient renovation and building

2025



Shoolini University of Biotechnology and Management Sciences,
Solan, Himachal Pradesh, India - 173229

Energy Policy

2024

Shoolini University of Biotechnology and Management Sciences, Bajhol,

Solan, Himachal Pradesh, India-173229

shooliniuniversity.com/center-of-excellence-in-energy-science-and-technology

1. Preamble

Shoolini University is dedicated to advancing the United Nations Sustainable Development Goals (SDGs) through its comprehensive Energy Policy, which aims to create a sustainable, energy-efficient, and environmentally responsible green campus. This policy extends to all aspects of the University's operations, including building design and renovation, transportation, environmental management, water conservation, and other institutional activities that contribute to sustainability and responsible resource utilization.

2. Policy Objectives

- To enhance thermal comfort, energy efficiency, and water conservation while reducing energy use in all new Shoolini University buildings designed with solar passive and eco-friendly technologies.
- To install solar rooftop systems to promote renewable energy generation on campus
- To install LED bulbs and other energy-saving devices in the campus.
- To install solar water heating and solar cooking systems in all the residential and hostel areas of the University to save LPG and conventional fuels.
- To reduce CO_2 emissions through all possible measures and promote waste-to-energy initiatives for sustainable resource use.
- Encourage students and staff participation in energy-saving initiatives and ensure affordable, reliable, sustainable energy access for all.

3. Applicability

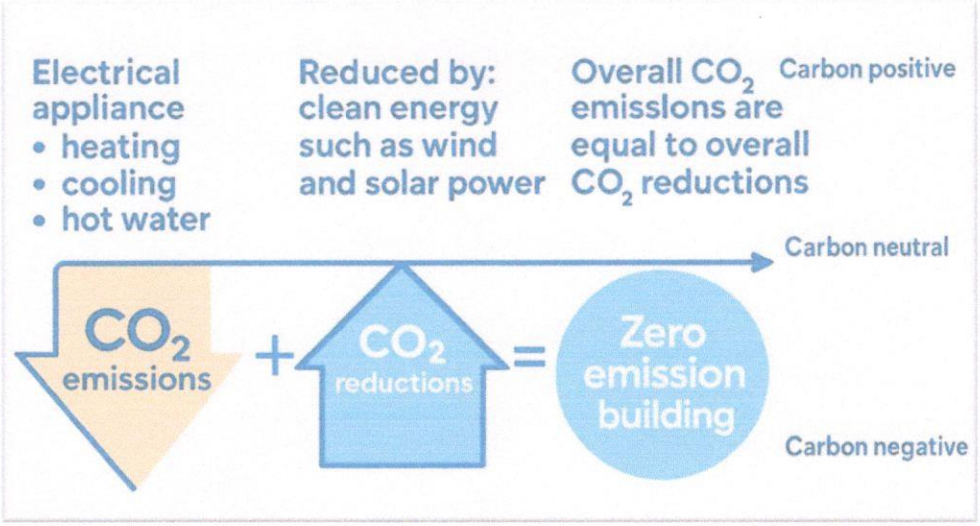
This policy applies to all departments, extensions, and surrounding villages of Shoolini University, involving students, faculty, and staff who are encouraged to actively participate in achieving the objectives of the energy policy.

4. Policy on Energy Efficient Passive Solar Buildings for Zero Carbon Emission

I. Introduction

Shoolini University is firmly committed to achieving Net Zero Emissions by 2028 through the implementation of energy-efficient and passive solar building designs that minimize energy consumption and carbon output. Guided by its Energy and Environment Policies, the university ensures that all new constructions and retrofitting projects integrate solar architecture, renewable energy systems, and sustainable materials to reduce dependence on fossil fuels. This

approach supports Shoolini's broader vision of developing a carbon-neutral, resilient, and sustainable campus, serving as a model for zero-carbon building practices in higher education.



II. Carbon neutrality in buildings

Zero-carbon buildings are those that generate no net annual greenhouse gas emissions from direct fuel combustion (such as natural gas) or electricity use associated with the operation of building-integrated systems and services.

- Building-incorporated services include all energy needs and systems within the structure, such as the thermal envelope, heating and cooling, water heating, built-in appliances, lighting, shared infrastructure, and renewable energy systems.
- Zero-carbon buildings must comply with defined standards for energy efficiency and on-site renewable energy generation.

Carbon-positive buildings go a step beyond zero-carbon by generating surplus energy on-site producing more power than they consume and exporting the excess back to the grid through net metering systems. These projects play a vital role in reducing overall carbon intensity and mitigating the negative impacts of traditional construction and lifestyle practices. Additionally, they help offset emissions in areas where achieving complete carbon neutrality is not feasible, thereby contributing to a more sustainable built environment and limit global warming.

III. Policy Statement, Strategy & Guidelines

a) Policy Statement

Shoolini University is committed to developing an environmentally responsible and energy-efficient campus. To achieve this, the University mandates that all new buildings be designed and constructed according to passive solar architecture principles and integrate energy-efficient building technologies as per the Solar House Action Plan and Policy of the Government of Himachal Pradesh. Additionally, the feasibility of retrofitting existing buildings with passive solar features and systems will be assessed to improve energy efficiency and reduce overall energy consumption. Necessary actions for implementation will be prioritized to ensure timely progress toward a low-carbon campus.

b) Coordination & Implementation Guidelines

i. The Centre of Excellence in Energy Science and Technology (CEEST) at Shoolini University will serve as the nodal agency to coordinate and oversee the Solar Building Action Plan for the University.

ii. A Technical Project Management Cell (TPMC) has been established within CEEST, led by the Director (Energy) as the Principal Coordinator. The TPMC includes experts in solar building design, renewable technology analysis, and construction management, along with the Director (Estate), architects, and civil/electrical engineering teams responsible for implementation and maintenance.

iii. A Computer-Aided Solar Passive Design Cell will be created, comprising an architect, structural and design engineers, an executive engineer, and a software programmer skilled in AutoCAD, seismic analysis, and building performance modeling. This cell will utilize solar radiation data, forecasting tools, and artificial intelligence techniques to optimize design efficiency and predict energy loads.

iv. All newly constructed buildings will function as live laboratories for energy education, research, and innovation, enabling hands-on learning and applied research for CEEST students and faculty.

v. CEEST will conduct training and orientation programmes for the University's technical, architectural, and engineering divisions to encourage the adoption of innovative and sustainable building technologies.

vi. Extending beyond the campus, CEEST will also promote passive solar design and sustainable housing practices in nearby villages as part of its community outreach and social responsibility initiatives. It will provide technical support to the Himachal Pradesh housing agencies to strengthen policy implementation and sustainable construction standards.

c) Strategy

To achieve zero carbon building standards, all carbon emissions must be offset through passive solar design, reduction in conventional energy consumption, and on-site renewable energy generation. This includes installing rooftop solar systems, waste-to-energy units, and adopting sustainable design principles.

Key strategies include:

- Integrating energy efficiency measures with renewable energy systems.
- Selecting building sites that maximize solar access, passive heating, and natural cooling.
- Incorporating passive design techniques to minimize overall energy demand.
- Implementing rainwater harvesting and water conservation systems, particularly for hot water use.
- Utilizing low-embodied-energy and sustainable materials that complement passive solar architecture.

d) Guidelines

Maximizing energy efficiency reduces the amount of renewable energy required to achieve carbon neutrality and enhances sustainability at multiple levels:

- Physical: Minimizes roof area required for solar PV or other renewable systems.
- Economic: Reduces system size and installation costs.
- Environmental: Decreases material usage and the environmental impact of system manufacturing.

5. Review

The Energy Policy will be reviewed from time to time and updated whenever required.

REGISTRAR

7.2.1 Energy-efficient renovation and building

Shoolini University implements **energy-efficient renovation and building practices** under its **Energy Policy**, originally established in 2019 and reviewed in 2024. The University promotes sustainable construction using eco-friendly building materials, solar-passive architectural features, and energy-efficient technologies to reduce energy consumption and environmental impacts. Shoolini University has **installed a 5-kW photovoltaic (PV)–wind hybrid system** near the Estate Office to supply clean electricity to various office loads. By integrating solar and wind energy into existing campus infrastructure, the system reduces dependence on conventional grid electricity and supports more energy-efficient campus operations. This initiative complements the University's broader efforts to improve building energy performance, promote renewable energy integration, and reduce the environmental footprint of campus facilities.

Shoolini University has implemented several other initiatives to promote energy-efficient renovation and sustainable building practices across the campus, as outlined below.

- Sustainable Building Construction
- 400 kWp Photovoltaic (PV) Power Plant Installed in Buildings Rooftops
- Use of Biogas for Cooking Using Cow Dung from the University Dairy
- Solar Thermal Steam Cooking System
- Installation of Automatic Weather Station
- Energy Efficient Air Heaters Installed in Students Hostel Rooms
- Heat-Pump Based System for Water Heating
- Energy-efficient LED lights Installed Across the Campus
- Installed 5-Kw Photovoltaic (PV)–Wind Hybrid System

Sustainable Building Construction:

- **School of Design:** The **Tagore School of Design** at Shoolini University stands as a benchmark for eco-friendly architecture, meticulously engineered to minimize its environmental footprint. Constructed primarily from low-impact, sustainable materials like wood and steel, the building seamlessly integrates into its natural pine forest surroundings. The design prioritizes energy efficiency by utilizing extensive natural daylighting, open-air hillside studios, and LED fixtures to drastically reduce reliance on the electrical grid.



School of Design building made of sustainable materials

- **Yogananda Ville Mud & Wooden Huts:** A dedicated eco-friendly zone featuring two-storey huts constructed entirely from local, sustainable materials like wood, bamboo, slate, stone, mud, and stabilized mud blocks. Built completely without cement, concrete, or steel, these huts leverage traditional insulation to stay warm in the winter and cool in the summer without artificial HVAC systems. They pull double-duty as high-tech e-Studios for digital lecture streaming.



Energy efficient Wooden and Mud Huts with solar access at Yogananda Ville

- **Installation of Trombe Walls:** Passive Solar Trombe walls have been incorporated into the Animal House to utilise passive solar heating and reduce electricity consumption for space heating. This structural wall acts as a thermal mass system that captures solar radiation throughout the day and naturally radiates heat indoors, drastically reducing the electricity consumed by artificial space heating.



Trombe wall built in constructed Animal House that reduces energy usage for space heating

400 kWp Rooftops Photovoltaic (PV) power plant

Shoolini University has installed a **400 kWp rooftop photovoltaic (PV) power plant** to generate clean electricity and partially meet the campus's energy requirements. The system converts solar radiation into electrical energy, providing a renewable alternative to conventional grid electricity. By integrating solar power into campus infrastructure, the University reduces its dependence on fossil-fuel-based electricity and supports the transition towards a cleaner and more sustainable energy system. The rooftop PV installation offers several environmental, operational, and institutional benefits. It helps reduce indirect greenhouse gas emissions associated with purchased electricity, contributes to climate change mitigation, and supports the efficient utilization of available rooftop space without requiring additional land for a ground-mounted solar farm. The system also helps diversify the

University's energy supply and can reduce exposure to fluctuations in conventional electricity costs.



400p PV Power plant installed on various buildings of Shoolini University

Use of Biogas for Cooking Using Cow Dung from the University Dairy

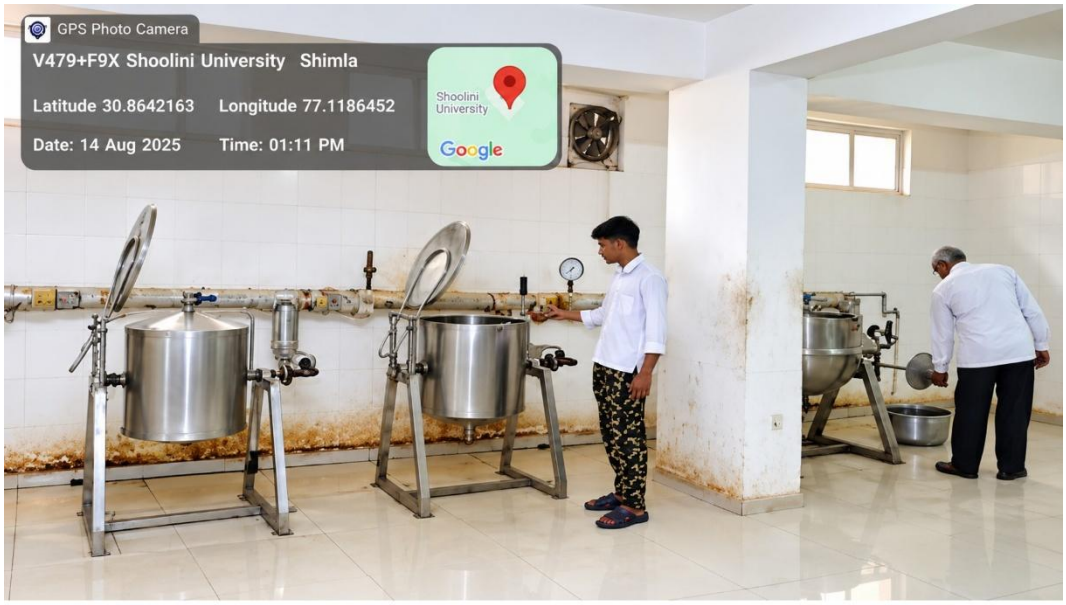
Shoolini University has installed a 1.5 m³ biogas system at its agricultural farm to utilize cow dung generated by the university dairy as a feedstock for renewable energy production. The system converts organic waste into biogas, which is used by farm labourers for cooking. This initiative promotes the productive reuse of animal waste and provides a sustainable alternative to conventional cooking fuels. The biogas system offers several environmental and operational benefits. It supports the circular use of organic resources by converting livestock waste into useful energy rather than allowing it to accumulate or require separate disposal. Using biogas for cooking can reduce dependence on conventional fuels, including liquefied petroleum gas (LPG) and other polluting fuels, depending on the extent to which they are displaced. It can also help reduce waste-related environmental impacts and improve the management of organic residues generated at the university farm. In addition, the initiative demonstrates the practical application of renewable energy and waste-to-energy technologies within a higher education institution.



Biogas plant for cooking installed in agriculture farm

Solar Thermal Steam Cooking System

Shoolini University utilizes a concentrated solar thermal (CST) steam cooking system for regular food preparation, demonstrating its commitment to adopting renewable energy technologies for sustainable campus operations. The system harnesses solar radiation and concentrates the available solar energy to generate heat and steam for cooking, thereby reducing dependence on conventional LPG-based cooking cylinders. By using solar thermal energy, the University can reduce conventional fuel consumption and the associated greenhouse gas emissions, subject to the amount of LPG displaced and actual system performance. Regular inspection and maintenance are undertaken to support the reliable and efficient operation of the system throughout the year. This initiative also demonstrates the practical application of renewable energy technology within a higher education institution and raises awareness of alternatives to fossil-fuel-based cooking.





Concentrated solar powered community steam cooking system

Installation of Automatic Weather Station

Shoolini University has installed an automatic weather station on the rooftop of its campus to monitor solar radiation and other meteorological parameters. The station facilitates the systematic collection of weather-related data, including information relevant to solar energy availability and prevailing atmospheric conditions. CEEST has installed a high-quality automatic weather station on the roof top of the library building that monitors global solar irradiance, wind speed, wind direction, temperature, relative humidity, rainfall data as well as photosynthetic active radiation which are critical for research and development of new energy

technologies, climate change related hence contributing towards research and development SDG-7 and SDG-13. The data are being used in boosting the reliable research and development of renewable energy technologies, by utilization of the renewable resources, and making plans for the sustainable township.



Automatic weather station installed at Yogananda Library Rooftop

Energy Efficient Air Heaters Installed in Students Hostel Rooms

Shoolini University has installed energy-efficient PTC air heaters in the University hostel to provide effective and comfortable heating.These heaters offer stable temperature maintenance and precise temperature control compared with conventional heating systems.Their use helps improve energy efficiency and reduce overall electricity consumption for space heating.This initiative supports SDG 7 (Affordable and Clean Energy) by promoting energy-efficient campus infrastructure.



PTC Air heater installed in one of the hostel rooms

Heat-Pump Based System for Water Heating

Shoolini University has installed solar water heating systems using flat-plate and evacuated-tube collectors across all university hostels to provide daily hot water for residents. These systems harness solar energy, reducing dependence on conventional electricity or other heating fuels. The initiative promotes energy efficiency, reduces the environmental footprint associated with water heating, and supports the adoption of renewable energy technologies across campus infrastructure. It contributes to SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).



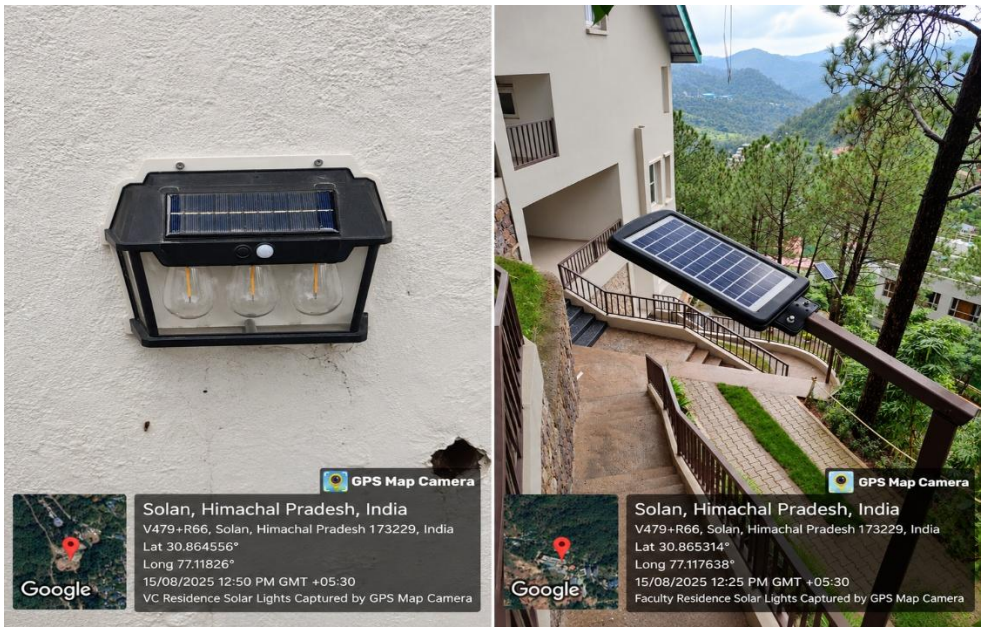
Energy efficient heat pump based solar system in roof top of Aryabhata hostel



Solar Pannel at rooftop of New Boys Hostel

Energy-efficient LED lights Installed Across the Campus

High-efficiency LED lighting has been systematically installed throughout all university buildings and along campus pathways. This widespread upgrade drastically cuts down overall electricity consumption while providing superior, reliable lighting efficiency across the entire institution.



Solar streetlights installed in the University campus



LED Lights installed at A Block Conference Room

Installed 5-Kw Photovoltaic (PV)–Wind Hybrid System

Shoolini University has installed a 2.5 kW Wind–Solar PV Hybrid Off-Grid Power Plant to support renewable energy generation and promote sustainable campus operations. The hybrid system integrates wind and solar photovoltaic technologies to harness renewable energy sources and support the University's commitment to clean energy and climate action.

Alignment with the UN Sustainable Development Goals:

- **SDG 7** – Affordable and Clean Energy: Promotes the use of renewable energy technologies.
- **SDG 13** – Climate Action: Supports efforts to reduce reliance on conventional energy sources and associated greenhouse gas emissions.



2.5 kW Wind–turbine Installed in Shoolini University

Conclusion

Shoolini University demonstrates a strong institutional commitment to energy-efficient infrastructure, sustainable construction, and clean energy integration through its Energy Policy and campus-wide initiatives. Eco-friendly buildings, passive solar design, rooftop photovoltaics, solar thermal cooking, and biogas utilisation collectively promote resource efficiency and reduce dependence on conventional energy sources. Energy-efficient LED lighting, PTC air heaters, solar water heating systems, and hybrid renewable energy technologies further strengthen sustainable campus operations. The University's approach integrates infrastructure development, renewable energy adoption, and research-driven environmental monitoring, supporting progress towards SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). By embedding sustainability into campus infrastructure and daily operations, Shoolini University establishes a practical model for greener, more energy-conscious higher education.

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