STANDARD OPERATING PROCEDURE (SOP)
ENERGY AUDIT
ST. BEDE'S COLLEGE, SHIMLA

SOP No.: Energy Audit/SOP/01/2026
Effective From: Academic Session 2026–27
Year of Establishment:
Approved By: Principal
Responsible Unit: Energy Audit

1. Purpose

The purpose of this Standard Operating Procedure (SOP) is to establish a systematic, measurable and documented procedure for conducting energy audits in educational institutions in Himachal Pradesh. It aims to assess energy consumption, identify wastage, improve energy efficiency, reduce electricity expenditure, promote renewable energy and develop a culture of energy conservation among students, faculty and staff.

The SOP is designed with reference to the role of the Himachal Pradesh Directorate of Energy as the State Designated Agency (SDA) for implementing energy conservation programmes under the Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. The Directorate has also issued guidance concerning the establishment of Energy Clubs in educational institutions under the Lifestyle for the Environment (LiFE) initiative.

2. Reference framework and applicable guidelines

The institution shall use the following references while planning and implementing its energy audit.

Himachal Pradesh Energy Conservation Building Code (HPECBC) and Rules, 2018: Relevant for building energy efficiency and applicable building-code compliance. The Himachal Pradesh Town and Country Planning (Seventeenth Amendment) Rules, 2026, published on 6 March 2026, specify applicability of HPECBC requirements to listed building categories, including educational buildings, with a total built-up area of 750 m^2 or more in planning and special areas, subject to the stated conditions.

Energy Conservation Act, 2001, as amended: Provides the national legal framework for energy conservation, including the role of BEE and State Designated Agencies. Institutions should verify whether any specific statutory audit obligations apply to their buildings or operations.

Bureau of Energy Efficiency

Himachal Pradesh Directorate of Energy and LiFE initiatives

BEE energy audit regulations and auditor requirements: The audit shall be conducted by a Bureau of Energy Efficiency (BEE)-certified Energy Auditor. The auditor shall carry out the assessment in accordance with applicable BEE requirements, relevant statutory provisions, the approved audit scope and accepted technical practices. Where a specific building-code approval or compliance process requires an empanelled

met. The institution shall verify the auditor's valid certification/credentials and retain engagement details and audit deliverables in its records.

The BEE-certified auditor shall determine the appropriate audit level, measurements, sampling, instrumentation and verification procedures based on the campus profile and audit objectives. Measurements shall be undertaken by competent, authorised personnel using suitable, calibrated instruments and appropriate safety precautions.

3. Scope of the energy audit

The SOP shall cover the entire campus, including academic, administrative, residential and service areas, wherever present.

Area or system	Parameters to be examined
Electricity consumption	Bills, meters, sanctioned load, maximum demand and power factor where applicable
Lighting	LED usage, illumination levels, daylight availability and unnecessary lighting
Electrical equipment	Computers, printers, projectors, laboratory equipment and office appliances
Heating and cooling	Electric heaters, heat pumps, air conditioners, ventilation and controls
Laboratories and workshops	Equipment operating hours, standby consumption and ventilation systems
Hostels and staff quarters	Lighting, water heating, cooking and common-area electricity
Water systems	Pumps, motors, storage tanks, leakage and operating schedules
Renewable energy	Solar photovoltaic systems, solar water heating and other installations
Building envelope	Windows, roof insulation, air leakage, shading and thermal comfort
Other energy sources	LPG, diesel, petrol, biomass and other fuels used by the institution

The audit should also consider Himachal Pradesh's varied climatic conditions, including cold winters, seasonal heating demand, local daylight availability and the energy requirements of buildings at different elevations.

4. Responsibilities and constitution of the Energy Audit Committee

The head of the institution shall constitute an Energy Audit Committee through an official order.

Designation	Responsibility
Principal/Director/Head of Institution	Overall supervision, approval and resource allocation
Energy Audit Coordinator	Planning, coordination, documentation and follow-up
Estate Engineer/Electrical Engineer	Technical inspections, electrical data and safety
Accounts/Budget Officer	Electricity bills, fuel expenditure and

	financial analysis
Laboratory/Department Representatives	Department-wise equipment inventory and usage patterns
Estate/Maintenance Staff	Maintenance records, operating schedules and corrective work
Faculty and Student Representatives/Energy Club	Awareness activities, observations and conservation campaigns
External Energy Auditor, where engaged	Technical measurements, energy analysis and audit recommendations

Responsibility rule: Electrical measurements, opening of electrical panels and other hazardous technical work must be performed only by authorized and suitably qualified personnel. Students may participate in awareness and non-invasive inspections but must not undertake hazardous measurements.

5. Procedure for conducting the energy audit

Phase I — Preparation and planning

Step 1: Issue the audit order.

The head of the institution shall issue an order specifying the audit coordinator, committee members, audit period, buildings covered, reporting date and approval authority.

The appointed BEE-certified Energy Auditor shall lead the technical audit, validate the baseline and findings, document assumptions and limitations, and submit a signed audit report with prioritised recommendations. The institutional committee shall facilitate access to records and premises and coordinate implementation; it shall not substitute for the auditor's independent technical assessment.

Step 2: Define the audit boundary.

Prepare a campus map or building list and identify:

- Academic blocks, administrative offices and libraries.
- Laboratories, computer centres and workshops.
- Hostels, canteens, kitchens and staff residences.
- Auditoriums, sports facilities, water pumps and external lighting.
- Solar systems, backup generators and other energy-consuming installations.

Step 3: Collect baseline records.

Collect preferably 12 consecutive months of data, and longer historical data where available.

- Electricity bills and meter readings.
- Monthly expenditure on fuels and backup generation.
- Building-wise floor area and occupancy.

- Number of students, faculty and staff.
- Operating days, working hours and vacation periods.
- Installed equipment, rated power and operating schedules.
- Previous audit reports and completed energy-saving measures.

Step 4: Prepare the audit schedule.

Plan inspections during normal working hours and, where appropriate, during peak heating, cooling or laboratory operation. The schedule should include all major buildings and systems.

Phase II — Preliminary inspection and data verification

Step 5: Conduct a walk-through inspection.

The audit team shall inspect all accessible areas and record:

- Lights, fans, heaters and equipment operating unnecessarily.
- Lights or equipment left on in vacant rooms.
- Excessive standby operation of computers and laboratory equipment.
- Poorly maintained motors, pumps and electrical equipment.
- Inadequate daylight use and inefficient heating practices.
- Water leakage and continuously operating pumps.
- Defective controls, timers and occupancy sensors.
- Opportunities for insulation, draught reduction and solar energy.

Record each observation with the building name, room number, equipment, date, photograph where appropriate and proposed corrective action.

Step 6: Verify meter and billing data.

Compare electricity bills with meter readings and investigate unexplained increases, abnormal consumption and differences between billing periods.

Check the following, where applicable:

- Sanctioned electrical load and recorded maximum demand.
- Meter multiplication factors and tariff category.
- Power factor and applicable penalties.
- Separate meters for hostels, laboratories, residences or other major loads.
- Generator operating hours and fuel records.

Phase III — Detailed technical audit

Step 7: Conduct an electrical energy assessment.

The authorized technical team shall examine electrical distribution, major loads and operating patterns.

Measurements may include voltage, current, power, power factor, maximum demand and energy consumption, using suitable calibrated instruments.

Record the following details for major equipment:

Equipment parameter	Required information
Identification	Building, room, equipment name and asset number
Rated power	Nameplate rating in W or kW
Quantity	Number of similar units
Operating time	Hours per day and days per year
Actual consumption	Metered kWh, where available
Condition	Good, needs maintenance or inefficient
Proposed action	Repair, control adjustment or replacement

Avoid estimating actual consumption solely from nameplate ratings where reliable measurements are available.

Step 8: Audit the lighting system.

Inspect classrooms, laboratories, offices, corridors, libraries, toilets and outdoor areas.

- Count LED, fluorescent, incandescent and other lighting fixtures.
- Record wattage, quantity and typical operating hours.
- Measure illumination in lux at representative work surfaces.
- Compare illumination with applicable standards and the room's intended use.
- Assess daylight availability, switching arrangements and occupancy controls.
- Identify opportunities to replace inefficient lamps with suitable LED fittings.

Lighting should not be reduced below appropriate levels for teaching, laboratory work, reading, accessibility and safety.

Step 9: Audit heating, cooling and thermal comfort.

This step is particularly important in Himachal Pradesh.

- Inventory room heaters, heat pumps, air conditioners and water heaters.
- Record ratings, operating schedules, temperature settings and maintenance.
- Inspect windows, doors, roofs, insulation and air leakage.
- Examine opportunities for passive solar heating, daylight use and thermal curtains.
- Assess whether heating equipment is used only in occupied spaces.
- Check whether heating and ventilation arrangements maintain adequate indoor air quality.

Do not recommend eliminating essential winter heating or ventilation where doing so could compromise health, safety or educational activities.

Step 10: Audit motors, pumps and laboratory equipment.

Inspect water pumps, motors, compressors, laboratory instruments, refrigerators, freezers, exhaust systems and workshop equipment.

Assess motor sizing, maintenance, loading, leakage, operating schedules and unnecessary standby operation. Where technically appropriate, evaluate efficient motors, automatic controls and variable-frequency drives.

Step 11: Assess renewable energy and building efficiency.

Review existing rooftop solar installations, solar water heaters and other renewable-energy systems.

Record installed capacity, generation data, downtime and maintenance history. Assess feasible additional installations, taking account of roof condition, shading, snow loading where relevant, structural suitability and electrical safety.

For new construction or major building work, separately verify applicable HPECBC and building-approval requirements.

Phase IV — Analysis and energy performance assessment

Step 12: Establish the baseline.

Calculate total annual electricity consumption, annual electricity expenditure and consumption of other fuels. Separate energy use by building or major system wherever metering permits.

Use consistent reporting periods and distinguish actual consumption from estimated values.

Step 13: Calculate energy performance indicators.

Use the following indicators as appropriate:

Indicator	Calculation
Annual electricity consumption	Sum of electricity consumption over 12 months (kWh/year)
Electricity cost	Sum of electricity charges over 12 months (₹/year)
Energy-use intensity (EUI)	Annual building energy consumption (kWh) ÷ relevant floor area (m^2)
Electricity per student	Annual electricity consumption (kWh) ÷ average student population
Electricity cost per student	Annual electricity expenditure (₹) ÷ average student population
Estimated annual savings	Baseline annual consumption − expected post-measure consumption
Simple payback period	Initial investment (₹) ÷ annual monetary savings (₹/year)

For EUI, clearly state whether the calculation includes electricity alone or all energy sources converted to a common unit. Use the same definition when comparing years or buildings.

Step 14: Identify and quantify energy-saving opportunities.

For each proposed measure, estimate energy savings, monetary savings, implementation cost and simple payback period.

Annual electricity savings may be estimated as:

$$\text{Annual Savings (kWh)} = \frac{\text{Power Reduction (W)} \times \text{Operating Hours/Year}}{1000}$$

This is an illustrative estimate. Actual savings depend on operating hours, controls, lighting requirements and the performance of the installed equipment.

Phase V — Prioritization and implementation

Step 15: Rank recommendations by priority.

Priority 1

No-cost and low-cost measures

Switch-off practices, optimized operating schedules, equipment maintenance, repair of leaks, awareness campaigns and correction of unnecessary standby consumption.

Priority 2

Moderate-investment measures

LED replacement, efficient fans, timers, occupancy sensors, improved pump controls and energy-efficient appliances.

Priority 3

Capital-intensive measures

Rooftop solar installations, building-envelope improvements, major heating-system upgrades, sub-metering and advanced energy management systems.

Priorities should also consider safety, educational needs, reliability, technical feasibility, life-cycle cost and the availability of institutional or government funding.

Step 16: Prepare the Energy Conservation Action Plan.

The committee shall prepare a written plan containing:

- Audit finding and supporting evidence.
- Proposed corrective measure.
- Estimated energy and cost savings.
- Capital and recurring expenditure.
- Responsible officer or department.
- Target completion date.
- Approval and procurement requirements.
- Method for verifying savings after implementation.

All procurement and expenditure shall follow applicable government financial rules, institutional purchase procedures and sanctioned budget provisions.

6. Reporting and approval

The Energy Audit Coordinator shall compile the report and submit it to the Principal/Director/Head of Institution for approval.

The final technical report shall be prepared and signed by the BEE-certified Energy Auditor, with the auditor's name, certification/credential details, audit dates, scope, methods, key measurements, assumptions and limitations clearly recorded. The Principal shall review and approve the institutional action plan. Any prescribed statutory submission shall follow the applicable process.

The report should contain the following sections:

1. Executive summary and major findings.
2. Institutional profile, building inventory and audit boundary.
3. Applicable statutory and policy references.
4. Electricity and fuel consumption baseline.
5. Technical inspection and measurement results.
6. Energy performance indicators.
7. Identified deficiencies and energy-saving opportunities.
8. Financial analysis and recommended investment.
9. Prioritized Energy Conservation Action Plan.
10. Monitoring arrangements and supporting records.

Where required by the applicable building-code process, the institution shall separately engage an appropriately empanelled auditor and submit the prescribed compliance forms and energy performance information. The 2026 Himachal Pradesh rules specifically describe auditor verification and energy performance reporting for covered building approvals.

7. Implementation, monitoring and verification

Step 17: Implement approved measures.

The responsible department shall complete the approved work within the specified time. The committee shall maintain an action-taken register and record reasons for delays.

Step 18: Monitor monthly energy consumption.

Maintain a file keeping all electricity bills showing electricity consumption, expenditure, occupancy, working days and relevant weather conditions. Investigate unexplained increases and compare performance against the baseline.

Step 19: Verify actual savings.

After implementation, compare measured consumption with the baseline while accounting for significant changes in occupancy, operating hours, weather and equipment use.

The percentage reduction in electricity consumption can be calculated using the following formula:

$$\text{Energy Savings (\%)} = \frac{\text{Baseline Consumption} - \text{Adjusted Actual Consumption}}{\text{Baseline Consumption}} \times 100$$

Use an adjusted baseline where operating conditions have changed materially. Document the method and assumptions used.

Step 20: Conduct periodic reviews.

As a recommended institutional practice:

- Monthly: Review electricity bills and consumption.
- Quarterly: Review implementation progress and unusual consumption.
- Annually: Conduct a comprehensive review and update the energy action plan.
- After major renovation or equipment replacement: Verify the effect on energy performance.

These are proposed institutional review intervals, not a claim that Himachal Pradesh mandates the same frequency for every educational institution. Any statutory or departmental frequency shall prevail.

8. Documentation and record maintenance

The institution shall maintain a dedicated Energy Audit File, in physical or electronic form, containing:

- Audit committee constitution order.
- Previous and current electricity bills.

- Meter readings and measurement sheets.
- Building and equipment inventory.
- Photographs and inspection checklists.
- Energy audit reports and recommendations.
- Approved budgets and purchase records.
- Maintenance and corrective-action records.
- Monthly energy consumption statements.
- Renewable-energy generation and maintenance records.
- Student awareness and Energy Club activity reports.
- Annual performance review and savings verification.

Records should be retained according to the applicable institutional record-retention and government financial rules.

9. Safety precautions

- Do not open live electrical panels or conduct hazardous electrical measurements without authorization and appropriate competence.
- Use calibrated instruments and suitable personal protective equipment.
- Follow electrical isolation and lockout procedures when required.
- Do not compromise fire safety, laboratory safety, indoor air quality or essential winter heating.
- Obtain permission before accessing rooftops, plant rooms, hostels or restricted areas.
- Protect student, staff and institutional information in photographs and records.

10. Institutional energy conservation measures

The institution should support the technical audit with a sustained energy-conservation programme.

- Establish or strengthen an Energy Club in line with relevant state initiatives.
- Display switch-off instructions in classrooms, laboratories and offices.
- Appoint departmental energy representatives.
- Conduct student awareness programmes, energy quizzes and conservation campaigns.
- Include energy conservation in campus sustainability activities.
- Encourage staff and students to report energy wastage.
- Recognize departments that demonstrate measurable improvements.

11. Model energy audit checklist

A. Records and Baseline

- Last 12 months' electricity bills collected
- Building area and occupancy recorded
- Equipment inventory prepared
- Fuel and generator records reviewed

B. Electrical Systems

- Meter readings and sanctioned load verified
- Lighting inventory and usage hours recorded
- Major motors, pumps and laboratory loads inspected
- Electrical safety issues documented

C. Building and Heating

- Windows, roofs and insulation inspected
- Heating and cooling schedules reviewed
- Daylight and ventilation assessed
- Winter energy requirements evaluated

D. Renewable Energy and Action Plan

- Solar installations inspected, if applicable
- Energy-saving measures identified and quantified
- Costs, savings and payback period estimated
- Responsible officers and implementation deadlines assigned

12. Expected outcomes

Implementation of this SOP is expected to help the institution:

- Establish a reliable energy-consumption baseline.
- Identify avoidable electricity and fuel expenditure.
- Improve the efficiency of lighting, heating, pumps and equipment.
- Reduce unnecessary energy consumption and associated emissions.
- Strengthen maintenance, accountability and budget planning.
- Promote student participation in energy conservation.
- Support applicable Himachal Pradesh building-code requirements and state energy-conservation initiatives.

Approved by: Principal, St. Bede's College, Shimla

Signature: Sr. Rosily Tom

Date: 03/11/2026

Energy Audit Coordinator: Dr. Reena Thakur

Signature: Reena 03/11/2026