

# **ENERGY AUDIT REPORT**

of

## **GOVERNMENT POLYTECHNIC, MIRAJ**

**April 2025 to March 2026**

**ELECTRICAL DEPARTMENT**  
**GOVERNMENT POLYTECHNIC MIRAJ**  
*Near Maji Sainik Vasahat, Vidyanagar, Miraj – 416410*

Total Number of Pages: 07



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No. GPM/Elect/Energy Audit/26/1

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**Energy Audit Report in r/o Government Polytechnic Miraj****1. Introduction**

Table 1.1: Particular of Government Polytechnic,Miraj

| Sr. No. | Particulars                         | Details                                     |
|---------|-------------------------------------|---------------------------------------------|
| 1       | Name of the Institute               | Government Polytechnic Miraj                |
| 2       | Address                             | Near Maji Sainik Vasahat, Vidyanagar, Miraj |
| 3       | Utility Supplier                    | MSEDCL                                      |
| 4       | Type of Consumer                    | HT, 11 kV, 50 Hz                            |
| 5       | Contract Demand                     | 110 kVA                                     |
| 6       | Total Connected Load                | 289 kW                                      |
| 7       | Transformer Type                    | 315 kVA, DY11 Vector Type, 11/0.433 kV      |
| 8       | Solar Capacity (Installed Jan 2025) | 80 kW On-Grid Net Metering                  |
| 9       | Consumer No.                        | 279019001169                                |
| 10      | Tariff                              | HT-VIII A (Public Services)                 |
| 11      | Energy Billing duration for Audit   | April 2025 to March 2026                    |

**1.1 Objective of Energy Audit**

The objective of the audit was to study the energy consumption pattern of the facility after installation of the 80 kW On-Grid Solar Net Metering system, identify areas where potential for energy/cost saving still exists, evaluate the performance of the solar plant, and prepare proposals for further energy/cost saving along with investment and payback periods.

**2. Electrical Supply and Connected Load Details**

Government Polytechnic Miraj uses three-phase 11 kV, 50 Hz energy supply of Contract Demand 110 kVA with 315 kVA, DY11 Vector Group, 11/0.433 kV Oil Cooled Distribution Transformer from MSEDCL having Connected load 289 kW. An 80 kW On-Grid Solar PV system with Net Metering was commissioned on 02 January 2025.

Table 2.1: Supply Details

| Details of Electricity Demand           | Value   | Unit |
|-----------------------------------------|---------|------|
| Connected Load                          | 289     | kW   |
| Contract Demand                         | 110     | kVA  |
| 55% Contract Demand                     | 60.50   | kVA  |
| Recorded Maximum Demand (typical range) | 19 – 43 | kVA  |
| Billed Demand (75% of CD)               | 83      | kVA  |
| Solar Capacity                          | 80      | kW   |

Observation: Total Contract Demand is 110 kVA while the recorded Maximum Demand during 2025-26 typically ranges between 19–43 kVA, well below the 75% of CD (83 kVA) billed demand threshold.

Table 2.2 Connected Load (Department-wise)

| Sr. No. | Department / Section | Total TPN Load (kW) |
|---------|----------------------|---------------------|
| 1       | Mechanical           | 31.54               |
| 2       | Applied Mechanics    | 20.63               |
| 3       | Medical Electronics  | 4.00                |
| 4       | Computer Engineering | 13.86               |
| 5       | BSH                  | 0.86                |
| 6       | Civil                | 5.00                |
| 7       | Mechanical Workshop  | 108.03              |
| 8       | Campus               | 11.80               |
| 9       | Plastic              | 5.08                |
| 10      | Electrical           | 22.60               |
| 11      | Lighting             | 67.80               |
|         | <b>Total</b>         | <b>289.0 kW</b>     |

Table 2.3 : Energy Efficient Appliances in the Campus

| Sr.                               | Appliance                   | Nos. | Watt each | Total (kW) |
|-----------------------------------|-----------------------------|------|-----------|------------|
| 1                                 | Ceiling Fan                 | 700  | 75        | 52.5       |
| 2                                 | LED Tube Light              | 1100 | 20        | 22.0       |
| 3                                 | Computer                    | 350  | 200       | 70.0       |
| 4                                 | CNC Machine                 | 1    | 15000     | 15.0       |
| 5                                 | VMC Machine                 | 1    | 13000     | 13.0       |
| 6                                 | Geyser ( 180 Girls Hoste)   | 10   | 3000      | 30.0       |
| 7                                 | Air Conditioner 1.5 T Split | 12   | 1500      | 18.0       |
| 8                                 | Submersible Pump I          | 3    | 2200      | 6.6        |
| 9                                 | Submersible Pump II         | 3    | 3700      | 11.1       |
| 10                                | Welding Machine             | 1    | 4000      | 4.0        |
| Energy Efficient Appliances Total |                             |      |           | ~242.2     |

Percentage of Energy Efficient Appliances  $\approx$  80% (including LED lighting, star-rated fans, solar water heaters and the 80 kW solar PV system).

### 3. Historical Data Analysis

#### 3.1 Study of Monthly Units Consumption & Power Factor

The electrical bills from MSEDCL for the available months of the period April 2025 – March 2026 have been studied. Due to net metering, the billed energy (net import after solar adjustment) is substantially lower than the actual campus consumption.

Table 3.1.: Monthly Consumption &amp; Bill Summary (Selected Months)

| Month  | Net kWh | kVAh  | PF    | MD (kVA) | Bill (Rs.) | Solar Gen. |
|--------|---------|-------|-------|----------|------------|------------|
| Apr-25 | 2,356   | 2,736 | 0.861 | 30       | 60,710     | ~9,910     |
| Jul-25 | 2,872   | 3,216 | 0.893 | 21       | 20,780     | ~6,383     |
| Nov-25 | 2,616   | 2,966 | 0.882 | 40       | 90,300     | ~8,000*    |
| Feb-26 | 2,408   | 2,843 | 0.847 | 20       | 90,250     | ~9,052     |
| Mar-26 | 6,018   | 6,702 | 0.898 | 43       | 1,82,340   | ~10,079    |
| Jun-26 | 3,817   | 4,298 | 0.888 | 19       | 1,52,330   | ~8,592     |

\* Estimated from trend / solar report average. Net kWh = billed consumption after solar adjustment. March & June 2026 bills include Grid Support Charges and Debit Bill Adjustments under new tariff.

#### Key Observations from Bills

- Net grid import after solar adjustment is typically 2,300–4,000 kWh/month (vs. 6,000–11,000 kWh in 2020-21).
- Average monthly bill (pre-March 2026) ranges Rs. 20,000 – 90,000; post-March 2026 bills rise due to Grid Support Charges ( $\approx$  Rs. 12,000–14,000) and Debit Bill Adjustments.
- Power Factor remains healthy (0.85–0.99); yearly average  $\approx$  0.89–0.96. Scope exists to reach unity.
- Recorded MD is consistently low (19–43 kVA) against Contract Demand of 110 kVA and billed demand of 83 kVA.
- TOD pattern shows significant consumption in Zone D (evening) and Zone A (night); opportunity to shift pump loads to Zone A.

#### 3.2 Comparison with 2020-21 Baseline

Table 3.2: Comparison with baseline load without solar

| Parameter                       | 2020-21       | 2025-26 (post-Solar)     |
|---------------------------------|---------------|--------------------------|
| Annual Grid Import (approx.)    | 74,549 kWh    | ~35,000–45,000 kWh (net) |
| Annual Billing Cost             | Rs. 11,35,272 | Rs. 8–12 Lakh (est.)     |
| Avg. Monthly Bill               | Rs. 94,606    | Rs. 60,000–90,000*       |
| Recorded Max Demand             | 71 kVA        | 19–43 kVA                |
| Average Power Factor            | 0.742         | 0.89–0.96                |
| Solar Generation                | Nil           | ~98,160 kWh/year         |
| CO <sub>2</sub> Emission (grid) | 60.07 MT      | ~28–36 MT (net)          |

\* Higher bills in Mar–Jun 2026 due to new Grid Support Charges and tariff revisions. Overall energy cost still lower than 2020-21 baseline.

### 3.3 TOD Tariff & Suggestions

For all HT consumers the Time of Day (TOD) tariff is applicable. The day is divided into zones with differential energy charges.

Table 3.3: TOD Tariff

| Zone | Timing                         | Energy Charge (Rs/unit) |
|------|--------------------------------|-------------------------|
| A    | 00:00–06:00 & 22:00–24:00 Hrs  | -1.50 (rebate)          |
| B    | 06:00–09:00 & 12:00–18:00 Hrs  | 0.00                    |
| C    | 09:00–12:00 / 09:00–17:00 Hrs* | 0.80                    |
| D    | 18:00–22:00 / 17:00–24:00 Hrs* | 1.10 / higher           |

Suggestion: Operate submersible pumps during Zone A (night hours) to earn TOD rebate and reduce peak demand contribution.

## 4. Solar PV System Performance

An 80 kW On-Grid Solar Net Metering Project was commissioned on 02 January 2025 with technical support of Maharashtra Energy Development Agency (MEDA), Kolhapur and implementation by Seven Greens Solar Systems Pvt. Ltd., Mumbai. Funding was provided by District Planning Committee, Sangli.

### 4.1 Technical Specifications

Table 4.1: Technical Specification

| Parameter             | Details                           |
|-----------------------|-----------------------------------|
| Project Capacity      | 80 kW                             |
| Type                  | On-Grid Solar Net Metering        |
| Solar Panels          | 147 nos. × 545 Wp (Agarwal Solar) |
| Inverter              | Power One 80 kW                   |
| Commissioning Date    | 02 January 2025                   |
| Project Cost (actual) | Rs. 54.43 Lakh                    |
| Sanctioned Fund       | Rs. 58.24 Lakh                    |

### 4.2 Performance Summary (as of March 2026)

Table 4.2: Performance summary

| Parameter                           | Value                               |
|-------------------------------------|-------------------------------------|
| Monthly Average Generation          | ~8,180 kWh                          |
| Annual Generation (projected)       | ~98,160 kWh                         |
| Pre-project Monthly Bill            | ~Rs. 1.50 Lakh                      |
| Post-project Monthly Bill (typical) | Rs. 60,000 – 75,000                 |
| Estimated Annual Monetary Saving    | Rs. 8 – 10 Lakh (avg. Rs. 9.6 Lakh) |
| Simple Payback Period               | ~5.5 – 6 years                      |
| Expected Life                       | 25 years                            |
| Annual CO <sub>2</sub> Reduction    | ~80.5 MT                            |

### 4.3 Impact of New Tariff & Policy (from March 2026)

From March 2026, MSSEDCL introduced Grid Support Charges, revised banking rules and Debit Bill Adjustments. These reduce the net monetary benefit of solar generation:

Grid Support Charge: Rs. 12,000 – 14,400 per month (observed Mar–Jun 2026).

Banking of excess solar units is subject to new limitations and interim High Court orders.

Demand Charges continue to be levied on billed demand (83 kVA) and are not reduced by daytime solar generation.

Despite these changes, the solar plant continues to deliver substantial energy and environmental benefits. Evaluation should consider generation, CO<sub>2</sub> reduction and long-term energy security in addition to pure bill savings.

## 5. Carbon Di-Oxide Emission

For consumption of 1 Unit (1 kWh) of Electricity from the grid, CO<sub>2</sub> emitted is approximately 0.82 kg (CEA factor). Solar generation avoids this emission.

| Parameter                              | Value              |
|----------------------------------------|--------------------|
| Annual Solar Generation                | ~98,160 kWh        |
| CO <sub>2</sub> Avoided (0.82 kg/kWh)  | ~80.5 MT / year    |
| Equivalent Trees Planted (approx.)     | ~3,800 trees       |
| Net Grid Import CO <sub>2</sub> (est.) | ~28 – 36 MT / year |
| 2020-21 Baseline CO <sub>2</sub>       | 60.07 MT           |

## 6. Energy Conservation Proposals

With the 80 kW solar already operational, further opportunities focus on demand-side management, load shifting and remaining inefficient loads.

Table 6.1 Energy Conservation Proposal

| Sr. | Recommendation                                | Annual Saving (Rs.) | Investment (Rs.)  | Payback (Yr) | Type  |
|-----|-----------------------------------------------|---------------------|-------------------|--------------|-------|
| 1   | Shift pump loads to TOD Zone A (night)        | 25,000–40,000       | Nil (operational) | Immediate    | Short |
| 2   | Improve PF to near unity (APFC fine-tuning)   | 15,000–30,000       | 50,000–1,00,000   | 2–4          | Med   |
| 3   | Replace remaining non-LED lights / old fans   | 20,000–35,000       | 1,50,000–2,50,000 | 5–8          | Long  |
| 4   | Review Contract Demand reduction possibility  | 1,00,000+           | Nil (application) | Immediate    | Short |
| 5   | Additional 20–30 kW solar (if roof available) | 2–3 Lakh            | 12–18 Lakh        | 6–8          | Long  |

## 7. Observation and Findings

The salient observations and recommendations are given below.

- Government Polytechnic Miraj continues to use 11 kV HT supply with Contract Demand 110 kVA and connected load 289 kW.
- 80 kW On-Grid Solar Net Metering system commissioned 02 Jan 2025 is performing as expected ( $\approx 98,160$  kWh/year).
- Net grid energy import has reduced substantially (typically 40–60 % lower than 2020–21 levels).
- Recorded Maximum Demand (19–43 kVA) is far below Contract Demand; review of CD reduction is recommended.
- Power Factor has improved significantly compared with 2020–21 ( $0.74 \rightarrow 0.89\text{--}0.96$ ).
- New tariff elements (Grid Support Charges, banking restrictions) from March 2026 have moderated the pure monetary savings from solar.
- 14 Solar Water Heaters (200 L each) continue to save  $\approx 10,000$  units/year.
- Percentage of energy-efficient appliances has increased with LED lighting, solar PV and star-rated equipment.

Table 7.1 Summary of Key Metrics

| Metric                         | 2020-21        | 2025-26                  |
|--------------------------------|----------------|--------------------------|
| Annual Net Grid Units          | 74,549 kWh     | $\sim 35\text{--}45$ kWh |
| Solar Generation               | 0              | $\sim 98,160$ kWh        |
| Annual Bill (approx.)          | Rs. 11.35 Lakh | Rs. 8–12 Lakh            |
| Avg. PF                        | 0.742          | 0.89–0.96                |
| Max Recorded MD                | 71 kVA         | 43 kVA                   |
| CO <sub>2</sub> (grid-related) | 60.07 MT       | $\sim 28\text{--}36$ MT  |

## 8. General Recommendations

- i) All Class Rooms and labs to have Display Messages regarding optimum use of electrical appliances (lights, fans, computers, projectors).
- j) Keep the light row near windows OFF when natural light is sufficient.
- k) All projectors to be kept OFF or in idle mode when not in use.
- l) All computers to have power-saving settings (monitor & hard-disk off after 10/30 minutes).
- m) Comfort air-conditioning temperature to be set between 24 °C to 26 °C.
- n) Minimize demand by shutting down non-essential Hostel loads during working hours.
- o) Operate Submersible Pumps during Zone A (10 p.m. to 6 a.m.) to avail TOD rebate.
- p) Apply to MSEDCL for reduction of Contract Demand in view of consistently low recorded MD.
- q) Monitor solar generation monthly and maintain panel cleaning schedule for optimal output.
- r) Fine-tune / maintain APFC system to keep PF close to unity and avoid leading VAR injection under light-load conditions.

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## 9. Abbreviations

| Abbreviation    | Full Form                                           |
|-----------------|-----------------------------------------------------|
| APFC            | Automatic Power Factor Controller                   |
| BEE             | Bureau of Energy Efficiency                         |
| CD              | Contract Demand                                     |
| CO <sub>2</sub> | Carbon Di-Oxide                                     |
| HT              | High Tension                                        |
| kVA / kW / kWh  | Kilo-Volt Ampere / Kilo-Watt / Kilo-Watt Hour       |
| MD              | Maximum Demand                                      |
| MEDA            | Maharashtra Energy Development Agency               |
| MERC            | Maharashtra Electricity Regulatory Commission       |
| MSEDCL          | Maharashtra State Electricity Distribution Co. Ltd. |
| PF              | Power Factor                                        |
| TOD             | Time of Day                                         |
| YPC             | Yearly Per Capita Consumption                       |