OPTIMIZING ENERGY INFRASTRUCTURE IN EXISTING HEALTHCARE BUILDINGS

ASIA CLEAN ENERGY FORUM 2025
SESSION 3.2 - IMPROVING ENERGY EFFICIENCY IN BUILDINGS

WRI INDIA

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Context:

01 Why optimize energy infrastructure in existing healthcare buildings?

02 Improving energy systems in remote healthcare facilities through two-phase energy audits, efficiency upgrades, and hybrid solar solutions

03 Case studies from five not-for-profit healthcare facilities in Assam & Meghalaya (Northeast India)

Background & Objectives

01 **Challenge:** Rural & peri urban healthcare centers often rely on erratic grid power or diesel generators, risking service reliability. Energy costs and carbon emissions are high.

02 **Project Goal:** Transitioning facilities toward near net-zero electricity operation by integrating energy efficiency (EE) and renewable energy (RE) solutions.

03 **Pilot:** 5 not-for-profit healthcare facilities in Assam & Meghalaya of India were audited and upgraded.

04 **Strategy:** Conduct baseline energy audits to identify inefficiencies, then implement EE measures, on-site solar PV with battery storage/net metering, along with behavioral changes. Finally, verify savings and performance improvements in a second energy audit phase.

Two-Phase Energy Audit : Methodology

Phase 2 - Post - Intervention Energy Audit

- Verification energy audit measured actual outcomes
- Collected staff engagement and patient footfall and other data

Phase 1 - Baseline Energy Audit

- Conducted energy audits at each facility to map energy use
- Collected baseline data

Data Analysis

- Compared baseline vs. post - energy audit data

Profiles of Energy-Audited Healthcare Facilities in Assam and Meghalaya

Seva Nivas Hospital
Built-up area: 1861 m²
Sanctioned load: 30 kW
Backup power: Diesel generator set: 20 kVA
Existing solar PV system: 15 kW off-grid solar plant with 54 kWh battery backup

Queen Mary Care and Support Centre
Built-up area: 214 m²
Sanctioned load: 3 kW
Backup power: No
Existing solar PV system: 150 Wp solar panel with charge controller and 12 V, 40 Ah battery

Sacred Heart Health Centre
Built-up area: 217 m²
Sanctioned load: 5 kW
Backup power: No
Existing solar PV system: 40 Wp solar panel with charge controller and 12 V, 40 Ah battery

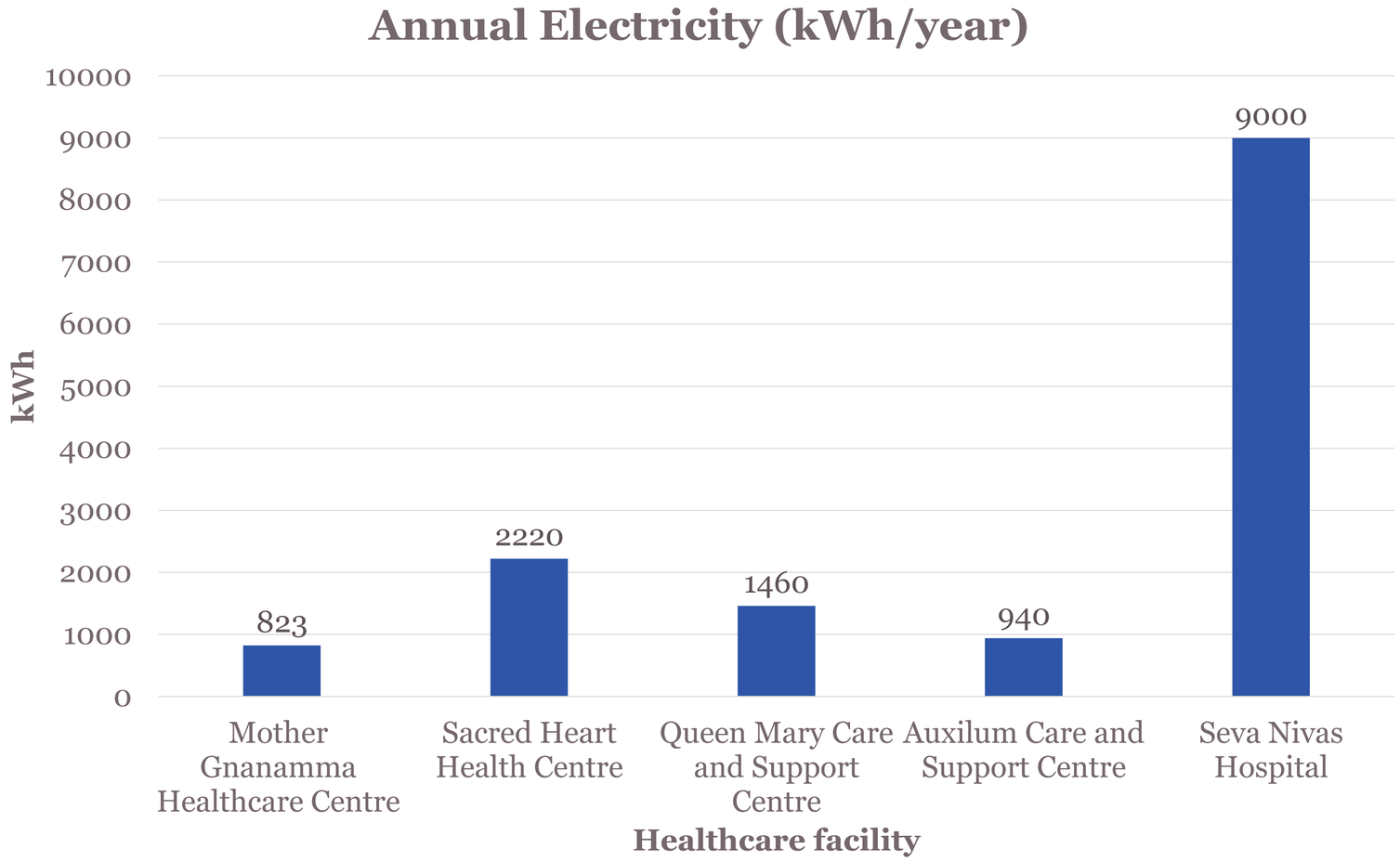
Auxilium Care and Support Centre
Built-up area: 226.1m²
Sanctioned load: 2 kW
Backup power: No
Existing solar PV system: No

Mother Gnanamma Healthcare Centre
Built-up area: 68 m²
Sanctioned load: 1 kW
Backup power: No
Existing solar PV system: No

Legend
- Assam
- Meghalaya

Baseline Energy Use in Facilities

- **The baseline audit:** revealed wide variation in energy consumption across the five healthcare facilities.
- **Energy Intensity (EPI):** Baseline Energy Performance Index ranged from about 4.2 up to 12.1 kWh/m²/year across the facilities.



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Implemented Interventions - EE & RE Measures

- **Lighting Retrofits:** Replaced outdated fluorescent tube lights and bulbs with LED lights
- **Fan & AC Upgrades:** Old ceiling fans were replaced with BLDC (brushless DC) fans, an aging old window AC was replaced with a 5-star energy rated split AC
- **Addressing Equipment Gaps:** Identified critical medical equipment
- **On-site Renewable Energy:** Each facility installed a tailored solar PV system + battery storage/net metering
- **Smart Energy Management:** Digital meters and remote monitoring systems (RMS) were deployed alongside the solar installations

Case Study: Seva Nivas Hospital (Detailed Analysis)

Efficiency Retrofits

- 28 T12 tube lights → 20-watt LEDs
- 21 old fans → BLDC
- 1 outdated window AC → 1.93 kW split inverter AC.

Investment & Payback

- Total energy efficiency investment: ~ ₹1.21 lakh (US ~ $1,464)
- Payback period: ~3 years on energy savings alone

Overview

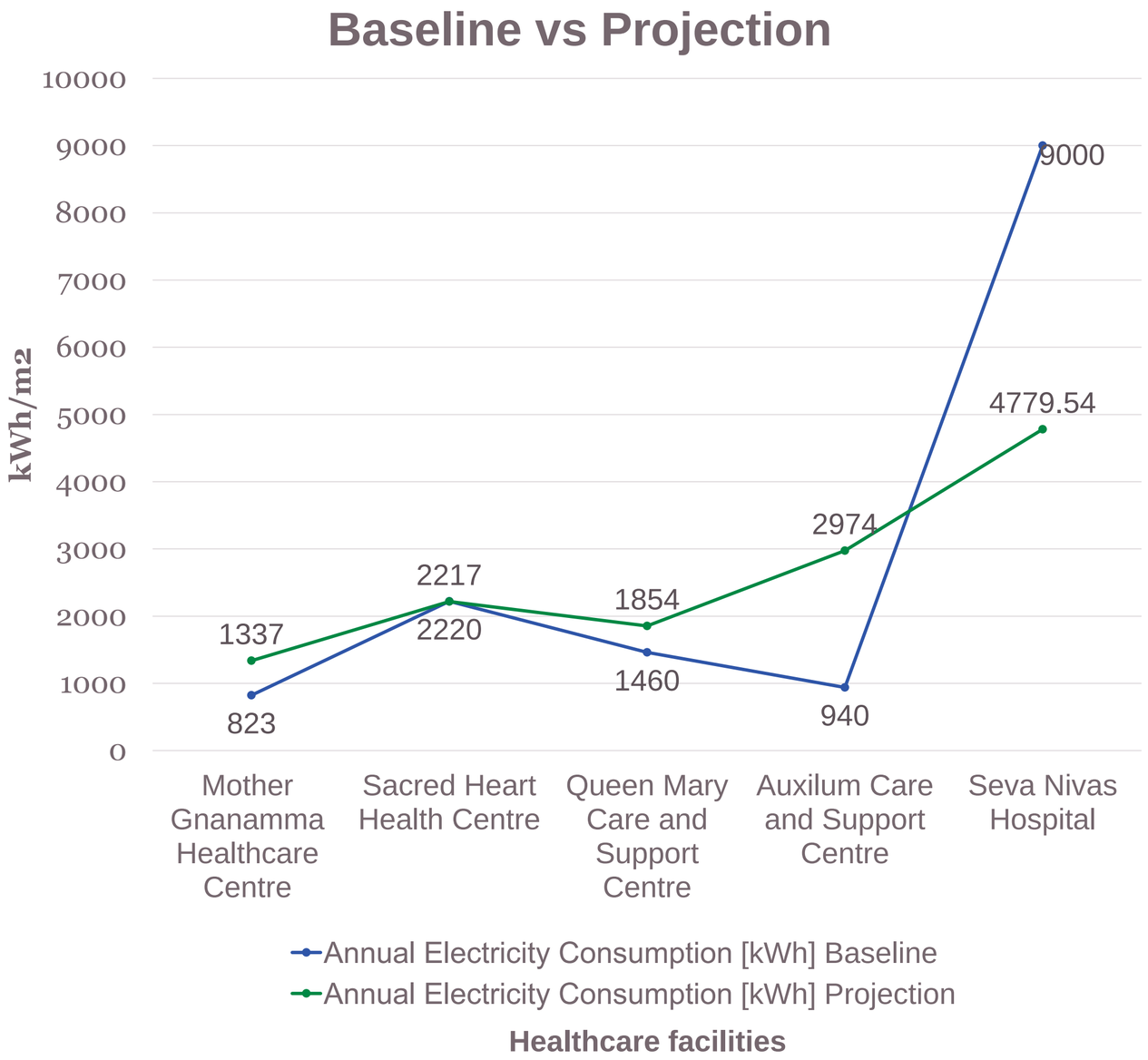
- A 50-bed charitable hospital in Assam
- Highest baseline consumption (9,000 kWh/year)

Energy & Cost Savings

- Verified savings: ~ 4,220 kWh per year
- Will result in 46.9% reduction in annual consumption
- Electricity cost savings will be ~ ₹44,000/year (US ~$532)

Performance Improvement

- EPI improved from 4.8 to 2.5 kWh/m²/year
- Enhanced efficiency combined with 15.4 kWp solar PV will support decarbonization



Post-Intervention Outcomes Across All Facilities

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Integration of Solar PV Systems & Smart Monitoring

- **Solar PV Deployment:** 39.6 kWp PV + 91.2 kWh batteries installed across all sites
- **Solar Contribution:** Solar met 87-100% of monthly demand in April 2025
- **Resilience & Diesel Reduction:** Solar-battery ensures backup for critical services (lighting, refrigeration, oxygen). Reduced diesel use aligned with healthcare decarbonization goals.
- **Smart Monitoring:** RMS and smart meters track solar, battery, and load performance remotely

Key Takeaways

1. Integrated EE+RE Approach Works
2. High Impact, Quick Paybacks
3. Solar Power Enables Energy Autonomy
4. Efficiency Despite Service Expansion
5. Resilience and Climate Benefits

Recommendations for Replication & Scaling

1. Energy demand assessment/ Audits as a First Step
2. Prioritize Low-Cost EE Retrofits
3. Leverage Solar PV + Battery for Reliability
4. Smart Monitoring & Training
5. Behavioral Change
6. Policy and Financing Support

Thank You

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