Review Article

Solarization of Rawalpindi Medical University: A Model for Sustainable Campus Energy

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Abstract

The implementation of a 500 kVA solar power system across multiple sites within Rawalpindi Medical University (RMU), emphasizing environmental, operational, and socioeconomic implications. Highlighting the institutional significance amid Pakistan's energy transition, it positions RMU as a case study for renewable energy integration in educational settings.

Keywords: Solar energy, renewable energy, RMU, energy sustainability, educational institutions

Contributions:
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FP, AM, FM- Acquisition, Analysis, Interpretation
AM - Drafting
MU - Critical Review

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Introduction

With escalating electricity costs, intermittent power supply, and increasing environmental concerns, the need for sustainable energy solutions in Pakistan's institutions is urgent. RMU's adoption of a 500 kVA solar initiative aligns with national goals of energy security and institutional resilience. The solarization of RMU directly contributes to several SDGs. It advances SDG 7 by expanding access to reliable renewable energy, supports SDG 8 through fostering green jobs and economic resilience, enhances SDG 3 by ensuring uninterrupted energy for healthcare and education facilities, and aligns with SDG 13 by mitigating carbon emissions and strengthening climate resilience.

Overview of RMU's Solarization Project

RMU has deployed photovoltaic (PV) technology at five critical sites—Lecture Theater Hall, Examination Halls, IT Department, Research Lab & Data Centre, Boys Hostel No. 1, and Girls Hostels Nos. 3 & 4. The hybrid system supports both reliable and efficient energy delivery across academic, research, and residential facilities.

National Context and Importance

Pakistan has enormous solar potential with an estimated capacity of 2.9 terawatt (TW). The solar energy being the most viable renewable form of energy in terms of cost, lifespan, and operational maintenance (1). Solar power capacity in Pakistan is rapidly expanding. By 2025, solar constituted over 25% of national generation—making it the largest power source in the mix (2, 9. Renewable energy's share in Pakistan's power capacity was about 10.6% in 2020, with goals to achieve 20% by 2025 and 30% by 2030 (3,10). Ali, M. (2016). Significance of CPEC in East Asia Countries & Its Impact on Pakistan Economy. *Available at SSRN 3527953*.

Benefits of Solarization in Educational Institutions

Environmental Sustainability (SDG 13): Solar reduces dependence on fossil fuels, curbing greenhouse emissions and contributing to climate action.The studies have highlighted the positive impact of solar installations in schools, particularly in underserved areas results in increased enrollment and contribute positively to educational outcomes (4). Moreover, solar provides energy independence and resilience, especially important in Pakistan's frequent grid disruptions (9;11). In educational spaces, integrating renewable systems aligns with global trends in energy-efficient infrastructure (EERES), offering sustainability and academic engagement (8).

Comparative Standing and Strategic Implications

RMU's 500 kVA solar deployment mirrors national efforts like the 400 MW Quaid-e-Azam Solar Park in Bahawalpur—the largest solar project in Pakistan (8;11). This positions RMU among

emerging green campuses adapting renewable tech, supporting national energy policy goals through practical implementation. The balance between on-site solar and national grid integration enhances both operational continuity and sustainability.

Challenges and Pathways Forward Upfront Capital Costs

Upfront Capital Costs: Solar infrastructure entails significant initial investment.
Performance Maintenance: Panels require cleaning and monitoring to maintain efficiency.
Grid Compatibility: Synchronized integration and storage solutions require technical planning.
Future Prospect for RMU: These pathways are also integral for achieving multiple SDGs. Expanded solarization contributes to SDG 7, job creation and innovation align with SDG 8, resilience of health and educational systems addresses SDG 3, while integrated storage and smart systems reinforce SDG 13.

- Expand solar capacity to cover more buildings.
- Integrate battery storage/licensed net-metering.
- Incorporate smart monitoring systems and broaden sustainability programs.

Table 1. Overview of RMU Solarization and SDG Contributions

RMU Solarization Practice	Relevant SDG Target	Contribution
Solar PV Installation	SDG 7.2 – Increase renewable energy share	Expands access to clean, affordable energy.
Reliable Power for Healthcare & Labs	SDG 3.8 – Access to essential health services	Ensures uninterrupted medical and research operations.
Cost Savings & Efficiency	SDG 8.4 – Resource efficiency in consumption/production	Frees resources for academic and research growth.
Green Jobs & Innovation	SDG 8.2 – Diversification, technological upgrading	Stimulates green employment and skill development.
Emission Reduction	SDG 13.2 – Climate action integration in policy	Contributes to national climate commitments.
Smart Monitoring & Storage Expansion	SDG 7.3 – Energy efficiency	Enhances resilience and efficiency of energy systems.

Conclusions

RMU's solarization initiative exemplifies how academic institutions can lead in sustainable practice, offering reliable, cost-effective energy while supporting education and research. The initiative serves as a blueprint for replicating green energy solutions in similar institutions across Pakistan. It not only strengthens institutional energy resilience but also advances the global sustainability agenda by contributing to SDG 7 (Clean Energy), SDG 8 (Economic Growth), SDG 3 (Health), and SDG 13 (Climate Action). It stands as a replicable model for universities and healthcare institutions in Pakistan and beyond.
In conclusion, RMU has demonstrated strong institutional adaptability through its rapid transition to e-learning during the COVID-19 pandemic. This experience highlights the university's broader capacity to implement strategic and sustainable initiatives, such as the solarization of the campus. Such efforts reflect RMU's commitment to resilience, innovation, and long-term sustainability [11].

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