
RESEARCH SUMMARY:

Powering Primary Healthcare through Solar in India: Lessons from Chhattisgarh

**POWER
FOR
ALL**



Improving Rural Primary Health Services through Better Electricity Access

The Council on Energy, Environment and Water (CEEW) completed a first-of-its-kind quantitative and qualitative study on the impacts of electricity access via distributed solar on rural healthcare services. The study, *Powering Primary Healthcare through Solar in India: Lessons from Chhattisgarh*, finds an immense opportunity for solar energy to bridge the gaps in electricity access and reliability in rural healthcare facilities, both as primary and backup source of power.

1 in 2

PHCS SUFFER FROM LACK OF ELECTRICITY ACCESS OR IRREGULAR POWER SUPPLY

38 million

INDIAN HOUSEHOLDS DEPEND ON HEALTH FACILITIES WITH NO ELECTRICITY ACCESS

98%

OF PHCS SAY SOLAR HELPED WITH DAY-TO-DAY FUNCTIONS

415MW

POTENTIAL FROM SOLARIZING RURAL HEALTH FACILITIES ACROSS INDIA

89%

OF SOLAR PHCS REPORT REDUCED ELECTRICITY COSTS

The Context: The State of Primary Health Centers (PHCs) in India

- » The Indian government has targeted universal health coverage. According to Rural Health Statistics (2016), on average 4.6% of PHCs across India are un-electrified, meaning more than 38 million households depend on health facilities with no electricity access. One in two PHCs suffer from lack of electricity access or irregular power supply.
- » This is particularly significant in India, where health deprivation has been identified as the second most important driver of poverty after living standards (UNDP, 2016).
- » India's poor state of health infrastructure is a key reason behind its place at 143 out of 188 countries in *The Lancet's* Sustainable Development Goal (SDG) health performance rankings (2016).
- » A quarter of all PHCs rely on generators or inverters for reliable power supply, with 7.5% of PHCs having a diesel generator.
- » Diesel power costs INR 24-26 per kWh while solar plus battery costs around INR 12-14 per kWh.

The Case Study: Chhattisgarh

Through the Chhattisgarh State Renewable Energy Development Agency (CREDA) and the Chhattisgarh Health Department, the government of Chhattisgarh (76% of the state's 20 million people live in rural areas) installed 2 kW PV systems with batteries across 570 PHCs in the state between 2012 and 2016. The study compares the experience of PHCs with PV systems and those without:

- » Based on a two-stage stratified random sampling method, the study surveyed 147 PHCs across Chhattisgarh. Among the 147 PHCs surveyed to assess the impact of the CREDA program, 134 were connected to the grid (the remainder were not grid connected) and in total 83 had solar systems while 64 did not. Of those PHCs that did not have solar, 11 had diesel backup generators.

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- » PHCs were categorized as power non-deficit (receiving 20+ hours of electricity from the grid) or power-deficit (receiving <20 hours of electricity from the grid); the power-deficit PHCs were further categorized into PHCs with and without solar. About 55% of grid-connected PHCs reported power cuts between 12pm and 4pm—their busiest hours.
- » However, of the total 147 PHCs, only 76 (51.7%) identified as power non-deficit, indicating that even many grid-connected PHCs suffer from unreliable or poor quality of power supply. In fact, a vast majority (90%) of grid-connected PHCs reported frequent power outages between 9am-4pm; 28% reported regular voltage fluctuations.
- » Moreover, while Chhattisgarh is a power-surplus state, only 66% of PHCs have regular power supply.
- » Thus, the survey finds that besides the absolute hours of electricity available, other major issues are: power outages occurring midday which significantly disrupt outpatient care during peak hours, and voltage fluctuations, which impact and even potentially damage medical equipment.
- » Of the 71 power-deficit PHCs, 38 (25.9%) had solar while 33 (22.4%) did not.

Results

PV systems allow PHCs to function more effectively and better deliver medical services:

- » With the average duration of reported power cuts being two to three hours, a 2 kW PV system with its storage design can easily provide a backup of close to three to four hours, thus augmenting grid supply.
- » Peak generation from PV systems also coincides with peak load times for PHCs (12pm - 4pm), which make solar not only an effective backup generation system but also a potential primary mode of power supply.
- » Most solar PHCs reported PV system serving as backup electricity source for outpatient services (86.5%), in-patient services (94%), and delivery services (91%). A majority of solar PHCs also reported supporting laboratory services (52%).
- » Solar rooftop systems can effectively meet needs for lighting, refrigeration, water pumping, and provide power for advanced medical equipment in health facilities.
- » The ability of PHCs to operate cold chain and newborn care equipment is substantially influenced by its access to regular power supply. About 22.4% of power-deficit PHCs currently rely on solar as backup to run cold chain equipment. This is particularly important in rural Chhattisgarh where the infant mortality rate (43) is still higher than average for rural India (41).

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- » For PHCs with more sophisticated equipment, the response was overwhelmingly satisfactory as well: 70% of solar PHCs with cold chain equipment, 65% of PHCs with microscope and centrifuge equipment, and 46% of PHCs with neonatal radiant warmers reported their PV system serving as an effective power source.
- » Overall, 89% of solar PHCs report reduced electricity costs due to their PV system and 79.5% report satisfactory power back-up support. An overwhelming 98% responded that solar has helped with day-to-day functions at the PHCs.
- » 64% of the surveyed PHCs indicated that they were able to meet their electricity needs using all available options. Among solar PHCs, the rate was higher at 84%. The rate was also higher than average (79%) among power-deficit PHCs using solar.
- » If solar were to be extended to cover all the public health facilities (Sub-centers with 1 kW systems, PHCs with 5 kW systems and Community Health Centers with 8 kW systems), the total potential can be as high as 415 MW (1% of India's national goal for rooftop solar).

Conclusion

The report concludes the following:

- » Reliable electricity access is a critical component of rural health system infrastructure
- » Augmenting electricity supply with distributed solar and giving priority to power deficit health facilities can improve service provision. Scaling solar across PHCs is in India's strategic interest.
- » Solar energy can provide stable electricity to power lighting, refrigeration, water pumps, and other vital advanced medical equipment. Moreover, it is both a cleaner and more economical source of energy than traditional diesel generators.
- » Impactful and sustained use of solar is driven by robust operations and maintenance services. Systems should be tailored to local needs and considerations.
- » Solar is meaningful not only as backup power for PHCs, but also as a primary source of power that can make a key difference in health outcomes.