How Kiambu County Is Harnessing Solar Energy to Reduce Expenses for Water Utilities

County:	**Kiambu**		
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Target Audience:	**County Governments, electrical engineers, climate change professionals, policy makers**		
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Introduction

Kiambu County has in recent years experienced steadily rising electricity bills, largely attributed to the growing number of grid-powered streetlights and boreholes across its 60 wards. As urban centers expanded and rural electrification increased, the cost burden of powering public infrastructure through the national grid became increasingly unsustainable.

A significant portion of the County's revenue has consequently been allocated to electricity payments to support essential services in sectors such as health, water supply, and street lighting. This growing

financial burden has constrained resources that could otherwise be invested in critical development priorities, including water expansion, road networks, health facilities, and other community infrastructure. In addition, reliance on grid power exposed service delivery systems to frequent outages. When power interruptions occurred, boreholes became non-operational, disrupting water supply to households, institutions, and businesses.

Beyond cost and reliability challenges, climate change considerations further reinforced the need for a transition to cleaner energy solutions. Grid electricity in Kenya is partly generated from fossil fuels, contributing to greenhouse gas emissions. According to the EPRA Statistical Report 2024, thermal power plants accounted for 8.42% of total electricity consumed in 2024, with an installed capacity of 627.1 MW.

Against this background, it became clear that a more reliable, cost-effective, and sustainable energy solution was necessary to safeguard service delivery and strengthen the County's resilience.

Implementation of the practice

To address these challenges, Kiambu County initiated a comprehensive solarization programme of County facility including boreholes, hospitals and public buildings. A notable project under this initiative is the solarization of Ondiri Water Scheme in Kikuyu Sub-County, Kiambu County. The scheme is located within the Ondiri Wetland which is the primary headland for the Nairobi River and has over 40 springs (Mwangi et al., 2018). It has 6 boreholes (five are hybrids and one is fully powered by solar) and produces 1500 M^3 of water per day. The scheme is managed by Kikuyu Water Company, an agency mandated to deliver and manage water services on behalf of the County Government. The scheme is a key water source for over 200,000 residents in Kikuyu and Kabete Sub-County (Kikuyu Water Company, 2025).

Figure 1Solar mini grid in Ondiri Water Scheme that will hold a total capacity of 338kWp

The County Government of Kiambu, working through Kikuyu Water Company, implemented the solarization of the scheme through a phased approach to improve sustainability, reduce operational costs, and strengthen energy resilience in water service delivery.

Phase I, implemented in 2022, involved the installation of a 240 kWp (Kilowatt-Peak-Peak) solar mini grid system by Kikuyu Water Company to power five boreholes that were previously fully reliant on the national grid. Following this intervention, the boreholes now operate primarily on solar energy during daylight hours and automatically switch to grid power only at night when solar generation is not available.

Phase II, implemented in 2024, was financially supported by the County Government through the installation of a 58 kWp solar system at a cost of KES 6 million to power a newly drilled borehole within the Ondiri Water Scheme. This borehole operates fully on solar energy, significantly reducing dependence on grid electricity. Since its commissioning, it has supplied over 70,600 m³ of water with zero electricity costs incurred.

Phase III is expected to deliver an additional capacity of 80kWp to power the remaining two boreholes in the scheme.

Figure 2: Solarized Borehole at Ondiri in Kikuyu that pumps 60m3/hr

Overall, the solarization of the scheme has enhanced operational efficiency of the water service providers by significantly reducing overhead costs associated with water service provision. Notably, electricity bills account for up to 40% (United States Environmental Protection Agency, 2025) of operating costs for drinking water systems. By transitioning to solar energy, the County is not only cutting costs but also strengthening energy resilience and advancing sustainable service delivery.

Key Implementers and collaborators for the project included:

- **Office of the Governor:** Policy direction and strategic leadership.
- **County Departments of Water, Environment, Natural Resources, Energy and Climate Change:** Overall coordination, procurement, and technical oversight.
- **Water Service Providers**: Implementation of solarization in water infrastructure.
- **Technical Contractors and Engineers**: Installation, testing, and commissioning of solar systems.

Results of the practice

The solarization of boreholes initiative has yielded measurable financial and service delivery benefits. Key outcomes of the initiative include:

1. **Cost savings:** Water Service Providers have reported over 35% (Kihanya, 2025) cost savings in boreholes that operate continuously (day and night) after transitioning to solar power. Solar panels have a service life exceeding 25 years, and solar streetlights require minimal maintenance compared to grid-powered systems, which incur recurring electricity and repair costs. By eliminating monthly electricity bills for solarized installations, the County is progressively reducing recurrent expenditure. These savings have been redirected to improve water supply systems and expand service coverage.
2. **Improved reliability:** Solar-powered boreholes are not affected by grid outages. This has ensured uninterrupted water supply.
3. **Environmental benefits:** The County has reduced its dependence on grid electricity, part of which is generated from fossil fuels (EPRA, 2025). This contributes to climate change mitigation and aligns with green energy and resilience goals.

While the programme is ongoing, preliminary assessments indicate positive returns both financially and socially. The reduced operational costs strengthen the service provider's fiscal sustainability.

Lessons Learnt

What Worked Well for Kiambu County included:

- **Strong political leadership:** Clear direction from the Governor accelerated decision-making and implementation.
- **Phased approach:** Implementing the project in stages made it financially manageable and allowed lessons from early phases to inform later rollouts.
- **Targeting high-impact areas First:** Prioritizing high yielding facilities generated quick wins and visible results.

Challenges Encountered

- The high initial capital investment required careful budgeting and planning. The programme required significant initial capital investment for procurement and installation of solar panels, inverters, and mounting structures. However, this upfront cost was justified by long-term operational savings.

- Technical standardization was necessary to ensure uniform quality across installations.

What Could Be Done Differently

- Earlier integration of solar in all infrastructure planning would have reduced cumulative electricity costs sooner.
- More structured data collection at the start would have strengthened baseline comparisons.

Overall, the initiative demonstrates that transitioning to renewable energy is not only environmentally responsible but also fiscally prudent.

Recommendations

The Kiambu County experience shows that solarization is a practical and replicable solution for Counties facing rising electricity costs and unreliable grid supply. Key recommendations include:

1. **Start with quick wins:** Solarize new boreholes immediately to prevent additional grid-based liabilities.
2. **Adopt a phased transition:** Gradually convert high-consumption infrastructure such as boreholes to solar power.
3. **Secure political and administrative buy-in:** Strong leadership commitment is critical to overcoming initial cost concerns.
4. **Invest in quality installations:** Use certified equipment and qualified technicians to avoid long-term maintenance issues.
5. **Track and document savings:** Establish clear baselines to quantify impact and strengthen accountability.
6. **Conduct regular energy audits:** Systematic audits will identify inefficiencies, optimize performance, and strengthen accountability.

What to Avoid

1. Delaying transition due to fear of upfront costs without evaluating long-term savings.
2. Installing substandard systems that compromise durability and public confidence.

Further reading:

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