Energy Needs in Primary Health Care in Nigeria and Niger: Findings from the Field

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Key Findings for Site Visits in Nigeria and Niger

- The 21 health clinics visited were served by **variety of electricity sources** (generator, solar, grid, none), but **none had reliable power**
- Estimated electricity use at clinics in Nigeria (median 16 kWh/day) was 10 times larger than in Niger (median 1.4 kWh/day), despite having similar needs
- Many clinics (esp. in Nigeria) were **wired for the grid but are located off-grid**
- **Generators** were more common in Nigeria; **rarely used due to lack of funds**
- **Solar PV systems** more common in Niger; most **failed within a few years**
- Clinics in both countries **need an adequate revenue stream for O&M** to enable reliable power on sustained basis
Field Research in Nigeria and Niger

• Visited 115 health clinics, schools, and water pumps in Nigeria and Niger, and conducted detailed audits at 57 sites, including 21 health centres.

• In the health sector, we mainly visited primary health care clinics
Health Facilities used a Mix of Energy Sources

- No electricity was available at 5 sites
- Others utilized solar, generators, or intermittent grid electricity, often in combination
- There were as many as 5 different electricity sources at a single site; the median was 2 sources per site
- Nearly half of the solar systems were impaired (and most of those that worked were relatively new)

<table>
<thead>
<tr>
<th>Electricity Source</th>
<th>Functional</th>
<th>Partially Functional</th>
<th>Not Functional</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generator (Fuel Operated)</td>
<td>9</td>
<td>1</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Solar (Fixed, standalone)</td>
<td>11</td>
<td>5</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Grid (National)</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Sum</td>
<td>22</td>
<td>6</td>
<td>6</td>
<td>34</td>
</tr>
</tbody>
</table>
Current Energy Use

- Though the energy needs at sites in Nigeria and Niger were similar, the existing energy use was much higher in Nigeria.
- Energy use was limited by failure of energy systems, failure of equipment, and lack of funds.

<table>
<thead>
<tr>
<th>Estimated Existing Energy Use (kWh/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Niger</strong></td>
</tr>
<tr>
<td>Average</td>
</tr>
<tr>
<td>Min</td>
</tr>
<tr>
<td>Max</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td><strong>Nigeria</strong></td>
</tr>
<tr>
<td>Average</td>
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<tr>
<td>Min</td>
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<tr>
<td>Max</td>
</tr>
<tr>
<td>Median</td>
</tr>
</tbody>
</table>
Common scenario: Grid connected facilities have very unreliable power (Kpeyegyi, Nigeria)

- Clinic has a grid connection, but the transformer has been broken for the past month.
- A generator is used to power the clinic when patients come in.
- When the grid was there, it was not reliable. Typical service is less than 6 hrs/day every other day.
- The staff use rechargeable lights when there is no power from the grid and when the generator is off.
Common scenario: Waiting for the grid (Gudupe, Nigeria)

- Clinic built in 2013 and supplied with electric light fixtures, fans, and an electric microscope
- The site does not have an electricity connection and is likely not to be connected in the next 8 years
- Currently the clinic staff uses rechargeable torches / flashlights when needed
Common scenario: Multiple systems and lack of O&M budget (Dafawa, Niger)

- 4 PV systems and 1 generator
- Battery-free PV refrigerator installed in 2017 and PV system privately owned by the head nurse are still functional.
- The older PV systems are used during the day since the battery and charge controller have failed.
- The generator is in good condition, but the site has no budget to purchase fuel, so it is not used.
Many clinics were designed to have grid power but were off-grid. If a solar power system is added, higher efficiency appliances are required.

- Lights and fans are pre-wired, often without consideration for energy efficiency. Fans were an especially large fraction of the load at some clinics.
- Many clinics have been provided with medical equipment, like electric autoclaves, that exceed the capacity of an affordable PV system.
Operation and maintenance of energy systems at health clinics

- 45% of sites in Nigeria and 100% of sites in Niger said they did not have sufficient budget to pay for maintenance of their existing energy systems.

- In Nigeria, existing expenditures on O&M ranged from $0 - $635 per month, with a median of $23 per month.

- In Niger, the clinics reported no monthly budget for O&M. Most sites used solar, but had no budget to maintain the systems. One site had a generator but did not use it due to fuel costs.
Solar power can meet many of a facilities energy needs, but...

- The system design must consider energy efficiency
- Prioritization of certain loads may be necessary
- A revenue stream for O&M must be in place to ensure long-term performance
Thank You!

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