Mini-grids in Uttar Pradesh

Policy Lessons

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UP’s Electrification Challenge

- **Understated deficits:** Sharp decline in energy deficits to 1.5% from 15.6% does not reflect actual demand
  - *Fundamental reason for ‘actual deficits’ is poor financial health of discoms – an intractable problem.*

- **Paradox of 100% village electrification:** All villages in UP are electrified but bar for electrification very low
  - Only 53 villages of the 18,452 electrified under DDUGJY have 100% electrification

- **Gap in household electrification:** Only 63% households connected to the electricity grid; 57% in rural areas
  - Electrification less than 30% in Lalitpur, Jalaun, Sonbhadra and Jhansi districts
UP’s Electrification Challenge

• The SAUBHAGYA Challenge
  – Requires connecting over 16 lakh rural HHs to grid every month
  – At current pace (15 lakh connections in 7 months), universal electricity access in UP could take 7 years
  – Rs 4,000 per HH budget insufficient: average cost of developing rural distribution networks is around Rs 2 lakh per km; cost for wiring each HH could vary from Rs 5,000 to Rs 10,000
  – Increased subsidy burden: Supplying power to 1.29 crore additional rural HHs would increase annual subsidy requirement of discoms by Rs 2,000–3,400 crore ~ 40% increase
UP’s Electrification Challenge

• **Inadequate rural supply:** Government claims 18 to 18:30 hours of supply (*Power to All, UPSLDC, CEA*), but on-ground reports indicate differently.
  – While power supply have improved in several parts, it continues to vary from 10–16 hours per day in rural areas.
  – *In CSE* surveyed 6 villages, rural supply restricted to 10-14 hours.
  – Unlikely that UP government/discoms will be able to supply 24x7 electricity to rural HHs in the near future.

### Electricity supply scenario in CSE-surveyed villages

<table>
<thead>
<tr>
<th>Location</th>
<th>Total HHs</th>
<th>Electrification</th>
<th>Hours of supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanda, Sitapur</td>
<td>737</td>
<td>70.4%</td>
<td>15–16</td>
</tr>
<tr>
<td>Kamplapur, Sitapur</td>
<td>132</td>
<td>95.5%</td>
<td>12–16</td>
</tr>
<tr>
<td>Katkutiyan, Kushinagar</td>
<td>819</td>
<td>42.4%</td>
<td>15–16</td>
</tr>
<tr>
<td>Tamakuhi Raj, Kushinagar</td>
<td>881</td>
<td>66.7%</td>
<td>10–14</td>
</tr>
<tr>
<td>Para Village, Unnao</td>
<td>1,212</td>
<td>24.0%</td>
<td>12–16</td>
</tr>
<tr>
<td>Dhankal Khera, Unnao</td>
<td>101</td>
<td>80.2%</td>
<td>10–12</td>
</tr>
</tbody>
</table>

Source: CSE Survey
UP’s Electrification Challenge

- **Missing peak supply:** Rural supply often not available in peak hours, when most needed.
  - UPSLDC’s supply schedule for CSE-surveyed villages indicates 2 to 4 hours gap in morning/evening peak periods.
  - Actual power supply data also points to major gaps – Example data from 10 villages of Sitapur

**Power availability in 10 villages in Sitapur district in April 2018 during evening peak**

- Thangaon
- Tedwadih
- Pahadpur
- Muradpur
- Manwan
- Khindaura
- Kankari
- Kamhira Kathura
- Dharampur
- Devtapur

Source: watchyourpower.org
**UP’s Electrification Challenge**

- **Prioritized urban supply:** Clearly evident disparity between rural and urban centers
  - Example: Actual power supply data for Sitapur district
  - Rural supply associated with higher network losses (double than urban areas)
  - Main reason commercial: low tariffs; low metering, billing and collection rates; higher theft. These issues may get addressed under SAUBHAGYA and UDAY, but remain unresolved as of now.

**Power supply position to domestic consumers in Uttar Pradesh during April 2018**

<table>
<thead>
<tr>
<th>Location</th>
<th>No supply duration</th>
<th>Low voltage duration</th>
<th>Normal voltage duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vijay Laxmi Nagar, Sitapur</td>
<td>6%</td>
<td>45%</td>
<td>91%</td>
</tr>
<tr>
<td>Pahadpur, Sitapur</td>
<td>3%</td>
<td>44%</td>
<td>4%</td>
</tr>
<tr>
<td>Bhadupur Sidhuali, Sitapur</td>
<td>12%</td>
<td>49%</td>
<td>7%</td>
</tr>
<tr>
<td>Jankipuram, Lucknow</td>
<td>2%</td>
<td>7%</td>
<td>98%</td>
</tr>
</tbody>
</table>

Note: Data for 720 hours; Source: watchyourpower.org
Mini-grids in UP

- 1,850 mini-grids aggregating 3 MW capacity operational; target is to increase this to 10 MW under *Power for All*
- Dominated by private players backed by public and private capital subsidies (Limited government presence: 16 UPNEDA systems set up as demonstration projects)
- Varied operational models adopted based on company objectives and local requirements/conditions.

**System size and connection load:**
- Over 90% systems very small in capacity (less than 1 kWp); Distribution networks flimsy and can handle only limited loads
- All CSE-surveyed systems had load inhibitors installed to provide 20–60 W HH connections
- Large UPNEDA systems serve 150 W load per HH, against 500 W given by discoms.
Mini-grids in UP

- **Low service standards**: Systems are set up to supply electricity for limited hours (4-6 in a day); Husk Power only one aiming 24-hour supply, which is not being achieved due to low demand.
- **High tariffs**: Several times higher than grid supplied power; wide-variations across systems and consumer categories; Range from Rs 20–Rs 150 per unit — not transparent as customers are charged on load.
- **Reasons cited for high tariffs**: Short payback period; High fixed cost for a small systems; Benchmarked on expenditure on kerosene for lighting ~ proxy for willingness/ability to pay

<table>
<thead>
<tr>
<th>Company</th>
<th>Costs of connection</th>
<th>Effective tariff (Rs per unit)</th>
<th>Hours of usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMC Power</td>
<td>15 W – Rs 110</td>
<td>40.7</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>34 W – Rs 230</td>
<td>37.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 W – Rs 300</td>
<td>33.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 W – Rs 630</td>
<td>35.0</td>
<td></td>
</tr>
<tr>
<td>Husk Power</td>
<td>34 W – Rs 230</td>
<td>37.6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>50 W – Rs 300</td>
<td>33.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 W – Rs 630</td>
<td>35.0</td>
<td></td>
</tr>
<tr>
<td>Boond Engineering</td>
<td>20 W – Rs 60</td>
<td>16.7</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>60 W – Rs 350</td>
<td>32.4</td>
<td></td>
</tr>
<tr>
<td>MeraGao Power</td>
<td>20 W – Rs 120</td>
<td>28.6</td>
<td>7</td>
</tr>
</tbody>
</table>
Subsidies supporting telecom towers?

- Number of mini-grids rely on telecom towers for anchor load – provide consistent & stable 24/7 demand, and steady cash flow.
- Issue: Effectively diverts subsidies and low-cost funds to help telecom companies reduce expense on diesel for running towers.
- Does little to address energy access issues — often only a 1/5th of power supplied to HHs
- Anchor load model should serve local commercial load – will establish commercial viability and increase local incomes.

**Average daily power supply pattern of two mini-grids in Sitapur**

<table>
<thead>
<tr>
<th>36 kW system in Sanda</th>
<th>36 kW system in Kamplapur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply to 120 connections 25%</td>
<td>Supply to 70 connections 18%</td>
</tr>
<tr>
<td>Supply to 2 telecom towers 75%</td>
<td>Supply to 2 telecom towers 82%</td>
</tr>
</tbody>
</table>
UP Mini-grid Policy, 2016

**Objective:** To address the issues of high tariffs and low supply hours; To put in place an investment climate that stimulates private participation.

**Key features:**

- 30% state subsidy to projects in addition to centre’s 30% subsidy, based on viability gap funding, to be determined by reverse bidding.
- Projects which do not avail state subsidy remain outside the purview of policy.
- Service standards for projects receiving state subsidies:
  - Daily minimum 8 hours of supply for residential consumers (3 hours in morning and 5 hours in evening) and 6 hours for production and commercial needs. Surplus to be supplied to other consumers.
  - HH tariff of Rs 60/month for 50 W load and Rs 120/month for 100 W load. For over 100 W load, mutually decided tariff by consumers and developers.
- Two exit options for developers:
  - Power generated by mini-grid can be sold to discom at a tariff decided mutually by developer, discom and UPERC.
  - Project may be transferred to discom at a price decided mutually between developer and discom.
Policy: Missing Points

• **Unviable tariff rates:** Subsidy insufficient for Rs 6–7 per unit HH tariffs
  – Other segment demand (small commercial/industrial) insufficient to compensate for low HH tariffs
  – Low demand profile of HH consumers (often 10 units)
  – With 30% MNRE subsidy HH tariff is Rs 16–40 per unit despite higher rates for commercial loads

• **Commercial uncertainties associated exit options:**
  – Tariffs to be determined at the time of exit/grid-integration. No clarity on calculation methodology. May be based on costs of solar/biomass projects in the area or discom’s average cost of power purchase – neither will be adequate
  – Parameters for determining sale price of mini-grids assets are not defined. Discom may not be interested in buying distribution assets and may offer only a fraction of generating asset’s value
  – Requires distribution networks to meet grid standards and codes – implying significant increase in investments

• **Result: Not a single project has come up under the policy**
Integrating Mini-grids

• All mini-grid systems running parallel to the grid
• Improving grid-based supply – a major threat to business
• Interaction between discom grid and mini-grids – can make business sustainable; improve affordability of power supply; avoid duplication of effort and investment in developing parallel networks.

• Possible business models:
  – Tail-end generation for grid or open access consumer
  – Distribution franchisee with a generation asset
  – Grid integration with net-metering
  – Back-up power supplier
  – Etc.

• Key requirement: Addressing policy, regulatory and market concerns.
Integrating Mini-grids

• Missing policy/regulatory guidance:
  – UP state policy provides two exit options but no certainty over commercial terms of agreement.
  – UP mini-grid regulation requires distribution network of large mini-grids (over 50 kWp) to meet stringent technical and safety standards; but implementation mechanism weak

• Critical issues:
  – Clearly define terms of commercial agreement upfront for all possible transactions with discoms.
  – Financial support for distribution network development
    • CSE estimates that developing mini-grid distribution infrastructure covering 5% of rural HHs in UP will be Rs 1,460 crores
Policy learnings

• Set targets and monitor growth

• Bring mini-grids under the regulatory purview:
  – Design mini-grids for minimum 8-12 hours of supply for households including mandated supply during peak hours
  – At least half of the total power generated should be supplied to households
  – Define grid codes and safety standards for mini-grid distribution network in line with the discom grid

• Charge mini-grid’s households same tariff as discom’s households.
  – Difference between LCOE and mandated tariff should be covered through government subsidy
  – Direct benefit transfer can be explored for effective implementation of subsidy
  – Or, operators can be given generation-based incentives linked to household power supply
Policy learnings

• **Provide capital subsidy for developing generation asset** based on viability gap funding through reverse bidding with a FiT for households
  – Review existing 30 per cent cap on state subsidy to make projects viable at FiT
  – Fix capital cost benchmarks before competitively bidding projects

• **Provide funding support for mini-grid distribution network** in compliance with grid codes and safety standards through central government-funded electrification schemes (like SAUBHAGYA).

• Define commercial terms of agreement for all possible exist/operational models:
  – **Price of assets:** Price of mini-grid generation and distribution assets should take into account its residual value. ERCs should provide guidelines / benchmarks to determine the residual value.
  – **Tariff for power:** Regulations must also be defined by the ERC to indicate the process of determining the tariff rate at which power will be sold to /purchased from the discom. The tariffs rates should be based on project cost and levelised cost of energy.
  – **Dispute settlement:** Mechanisms must be established for timely settlement of commercial disputes between mini-grid developers and discoms.
Thank you.