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 reflects 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

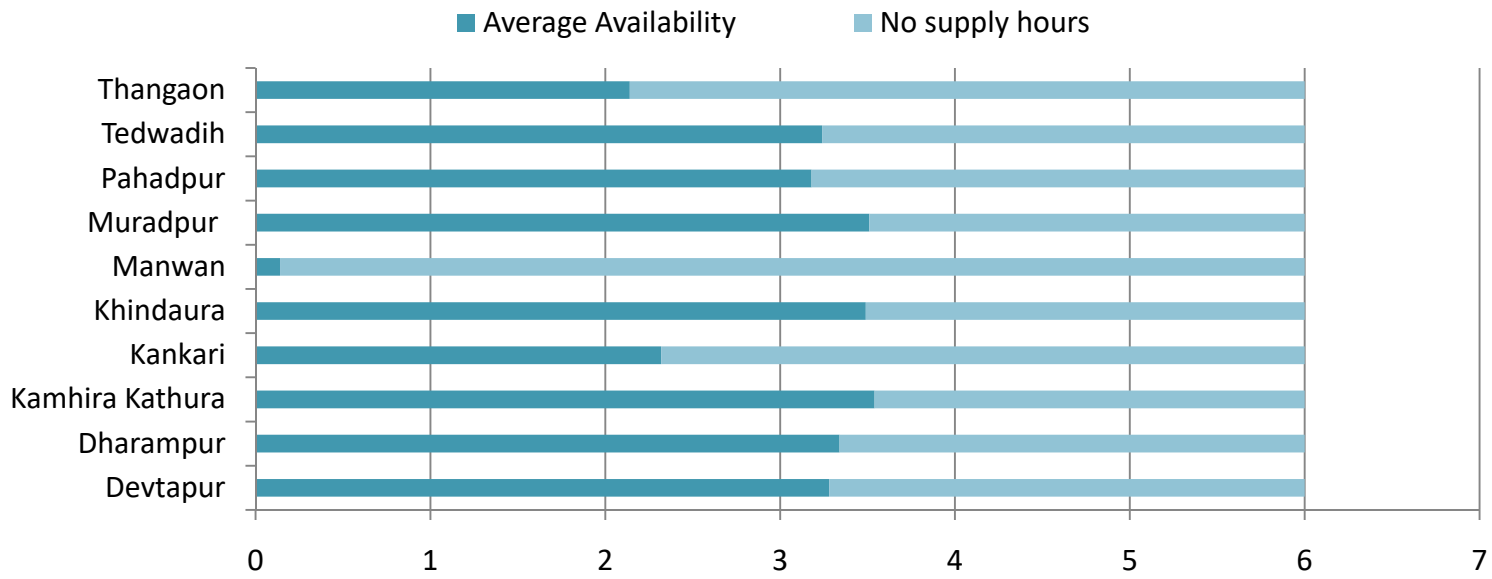
Location	Total HHs	Electrification	Hours of supply
Sanda, Sitapur	737	70.4%	15–16
Kamplapur, Sitapur	132	95.5%	12–16
Katkutiyan, Kushinagar	819	42.4%	15–16
Tamakuhi Raj, Kushinagar	881	66.7%	10–14
Para Village, Unnao	1,212	24.0%	12–16
Dhankal Khera, Unnao	101	80.2%	10–12

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

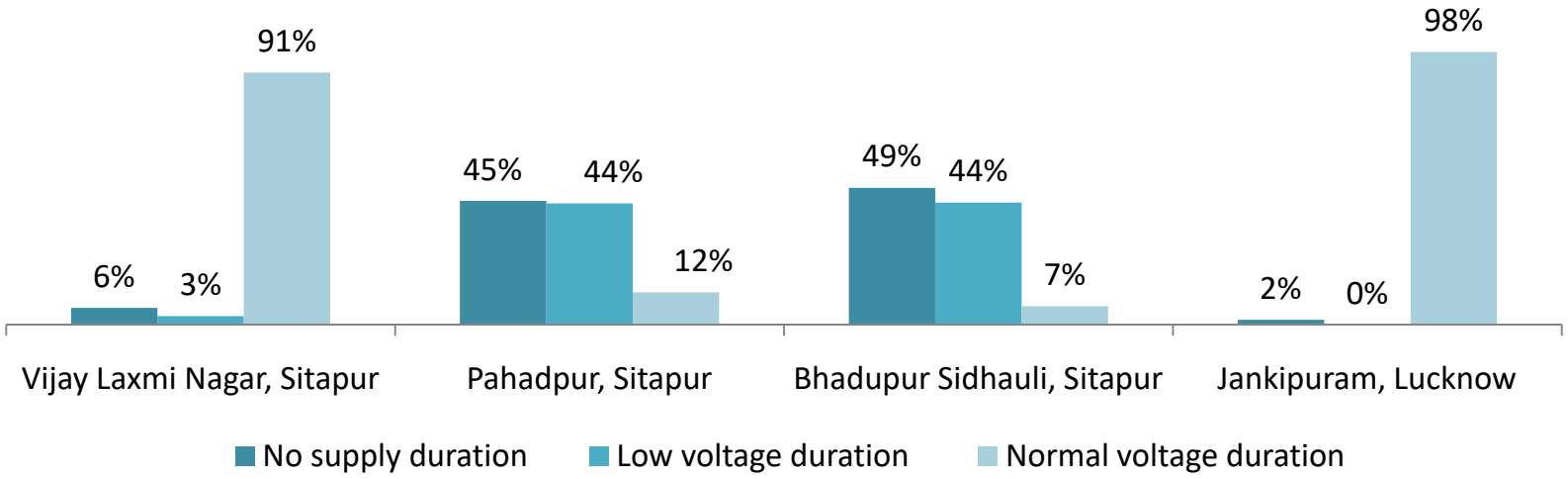


Source: *watchyourpower.org*

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



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

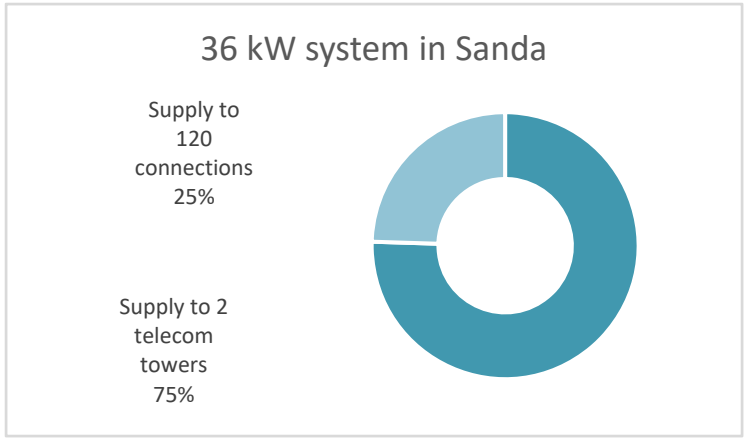
Tariffs of mini-grids operating in Uttar Pradesh

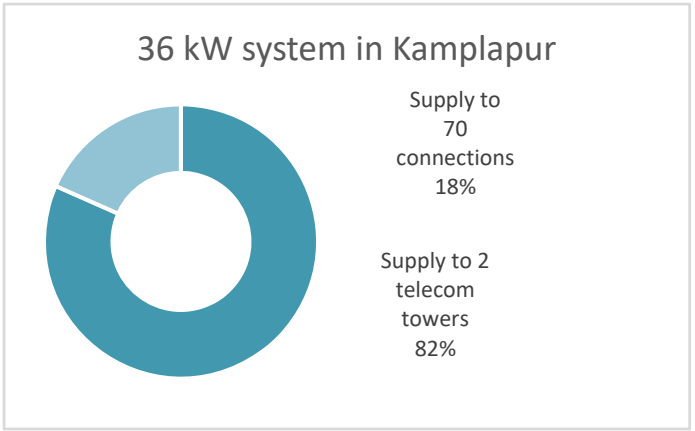
Company	Costs of connection	Effective tariff (Rs per unit)	Hours of usage
OMC Power	15 W – Rs 110	40.7	6
Husk Power	34 W – Rs 230	37.6	6
	50 W – Rs 300	33.3	
	100 W – Rs 630	35.0	
Boond Engineering	20 W – Rs 60	16.7	6
	60 W – Rs 350	32.4	
MeraGao Power	20 W – Rs 120	28.6	7

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





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:
  - Draft amendments to National Tariff Policy, 2016: Develop regulatory framework for compulsory purchase of power from mini-grids.
  - 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 coved 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.