

PATHWAYS LEADING TO 'POWER FOR ALL'

Framing Supply Resilience and Customer Management Through Mini-Grids

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Despite intensified government efforts and a major thrust laid on rural electrification infrastructure under India's Deen Dayal Upadhyay Grameen Jyoti Yojana (DDUGJY), about 50 million households (250 million people)¹ in rural India continue to remain unelectrified as on October 2016. Even as this center-backed scheme enables states and discoms to strengthen grid infrastructure, there are several lacunae at the state level. For instance, areas already connected to the central grid continue to face issues related to: lack of reliable and assured electricity supply and poor service quality with voltage fluctuations; curtailed hours of supply due to generation or transmission capacity constraints; lack of maintenance of distribution infrastructure, including distribution transformers and meters; and/or delay in fixing transformers and grid lines. The release of connections in a timely manner and at official costs prescribed by the state also remains a challenge.

Another key, though under-reported, gap is the non-availability of three-phase connections for small and medium enterprises – productive loads largely remain deprived of electric power in many parts of the country. These instead operate on diesel engines that are polluting as well as expensive, impacting the income and prosperity of the rural community.

In 2005, at the launch of Rajiv Gandhi Gram Vidyutikaran Yojna (RGGVY) scheme (now subsumed into DDUGJY), infrastructure being planned and deployed was expected to cater to the demands and requirement of agriculture (irrigation pump sets) as well as the small and the medium enterprises, which would then facilitate overall rural development, employment generation and poverty alleviation; in practice, almost all transformers in the villages electrified under the erstwhile RGGVY scheme

¹: State wise summary of DDUGJY as of October 2016



were single phase and couldn't cater to productive loads like flour mills, rice huller, oil expeller, etc. which require three-phase power.

Even though under the recent phase of DDUGJY, three-phase transformers have been installed in many villages, the infrastructure augmentation and/or revamp has focused only on those where electrification or intensification was undertaken in recent years. The villages that were electrified in the past have not been catered to in the same vein. Moreover, augmentation needed in these villages as per revised norms of the DDUGJY scheme requires relatively higher resource allocation (and it is not clear whether these would be covered under DDUGJY).

In many cases, these significant investments will have to be made through the business plan of the DISCOM but with major utilities joining the Ujjwal Discom Assurance Yojana (UDAY) scheme, it is unlikely that the Discom will incur these investments in this area, or appropriately address the lack of requisite capacity and

There still remain a few bottlenecks, which may come in the way of India achieving its "24x7 Power for All" goal by 2018-19 purely through centralized grid extension

skills within its staff managing their rural operations.

These key gaps are thus likely to persist for a while, given that progress or success is measured in terms of electrification intensification. To ensure appropriate focus on addressing these gaps and enabling a realistic "24x7 Power for All" outcome, there is a need to revisit and enhance the definition of village electrification, which has been in effect since 2004-5 to specifically include aspects such as:

- a) Availability of three-phase power
- b) 100% household-level electrification
- c) Assured supply during critical hours, which is typically the peak for the distribution system

This is important to ensure that spending is aligned to adequate and sustained outcomes on the ground, specifically with regards to livelihood resilience. If not, adverse ramifications on economic and human development which manifests as unemployment and poverty will continue to plague India.

Emerging directions for rural supply: Need for an alternate model

The unelectrified households in the country are concentrated across a few specific geographies offering a target area for mini-grid interventions. Almost half of the 50 million unelectrified households in the country are in Uttar Pradesh (35%) and Bihar (15%), followed by Madhya Pradesh (9%), Odisha (8%), Assam (7%) and Jharkhand (6%).



Even if there is significant progress under DDUGJY for household-level electrification (assuming 80% of unconnected households do get connected over next 2 years), there would still be need for alternate sources to supplement the centralized discom grid for almost 1.5 GW² capacity, even at basic lifeline³ consumption. Apart from the needs of unelectrified households, based on peak deficits in areas with less than 18 hours of supply, an additional 765 MW⁴ would be needed at the tail-end of grid, to support needs of these electrified rural households.

This need for this tail-end capacity, coupled with the gaps discussed in the previous section makes a strong case for the need for an alternate model that assures high-quality power supply and supports both domestic and economic needs of a rural area.

In response to this need, there has been a growing interest and uptake of Decentralized Renewable Energy (DRE)-based solutions, including mini-grids. Mini-grids in particular, have the potential to emerge as a

comprehensive community level solution for rural electrification- either as a substitute to the national grid in areas that are deemed to remain unelectrified or as a complementary solution to the grid to address under electrification in other rural areas. In short, with the appropriate policy support, these DRE-based mini-grids could emerge as holistic rural utilities. This transition requires a paradigm shift to ensure that these assets are dovetailed at a comprehensive level in the rural electrification planning.

Recognizing this, the government through the National Tariff Policy resolution released in January 2016, acknowledged the role of mini and micro grids and specifically mandated the State Electricity Regulatory Commissions to develop suitable regulatory mechanisms to protect mini-grid investments. The Policy mandates the Commissions to establish the tariff mechanism for any uplinks to the main discom grid. Some states are already in the process of creating appropriate frameworks to build on these provisions and institute

2: DDUGJY program updates REC; cKinetics analysis

3: Basic Lifeline Consumption of 1 kWh per day

4: CEA data; cKinetics analysis



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state-specific policies aligned to the needs of the concerned state.

In addition, the Union Ministry of New and Renewable Energy (MNRE) is in the advanced stages of drafting a national mini-grid policy which endeavors to implement 10,000 mini-grids across the country with a minimum installed RE capacity of 500 MW by 2021. The draft national policy also projects mini-grids as an intervention that can provide energy services beyond lighting loads and can assure reliable and cost-effective energy service that can cater to the productive and commercial loads, accommodate future loads, and connect with grid to feed surplus power, if needed.

Renewable Energy Service Providers (RESPs) that operate the mini-grids can also help address several concerns regarding supply resilience during peak hours and the quality of supply. They have the ability to truly emerge as a “Rural utility”, institutions with comprehensive capabilities to leverage electricity as an enabler for holistic needs

ranging from basic services, such as water to indicators of higher standards of living, such as entertainment and internet.

Mini-grids that are operational today in rural India are already catering to a wide variety of loads, such as rice hullers, flour mills and irrigation loads. They have successfully done so at a relatively minimal investment compared to grid extension, when considered at a consumer level. The cost of a connection for a productive load, such as a flour mill in a village without a three-phase transformer necessitates the prospective consumer to bear the investment in the transformer and additional poles, which can typically range from INR 2.5-3 lakhs⁵ to INR 10 lakhs⁶. Thus, a mini-grid makes better economic sense for the community and individual consumers residing therein – in addition to representing a more assured supply option. Many

mini-grid operators (MGOs) are also leveraging their presence in these villages to provide several other utility services, including providing water as a service to farmers for irrigation purposes, and powering enterprises delivering improved drinking water services; facilitating household upgradation to efficient appliances, including LED lights, energy efficient fans and TVs, and even piloting broadband for entertainment and internet among rural communities. These MGOs are increasingly investing in customer management capabilities to ensure they can entrench themselves deeply into the chosen markets.

The MGOs and RESPs that provide end-to-end service, including generation, transmission, distribution, metering, billing and collection are often privately funded. Therefore, they are also self-driven to ensure high levels of supply and customer

satisfaction. They are thus best suited to ensuring sustained supply to areas under their management and gain consumer trust and support, which in turn assures sustained payments. This provides a great beach-head for discoms in states to forge complementary partnerships with these RESPs.

If one were to go by policy advancements in 2016, the sector is already beginning to move in the direction of a prospective symbiotic construct.

Way Forward

A national-level programmatic framework could be an ideal way to facilitate the rapid evolution of mini-grid operators into a rural utility – this could be a core area of focus during the next phase of DDUGJY - with provision enhancements that enable mini-grids to function as effective last mile entities to deliver a 24x7 power construct. This would enable “Power

Current activities undertaken by MGOs

- Decentralized generation
- Local manpower
- Capital for investment
- Technical expertise on O&M

Enhancements needed to emerge as true ‘rural utilities’

- Bulk energy purchase and supply flexibility (without the burden of a licensing construct)
- Flexible and cost reflective feed-in-tariff



5: Uttar Pradesh Site Survey Data : cKinetics

6: MGO operator site level data Simdega, Jharkhand

If the existing MGOs are appropriately equipped as rural utilities, their last mile performance will improve significantly and sustainably.

For All” goals to be met closer to the time frames desired by the Central Government.

MGOs (or budding ‘rural utilities’) are uniquely positioned to support discoms and deliver on several services that were originally foreseen to be derived through Distribution Franchisees. These services include the ongoing challenges of bridging peak hour deficit, AT&C losses, better management of consumer behavior with the current schemes, and assuring requisite technical expertise for sustained operations and (O&M) maintenance of the village-level infrastructure.

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The framework could be shaped to even accommodate proposed amendments to the Electricity Act to segregate the distribution network business and the electricity supply business with carriage and content segregation. In case of such an eventuality, the MGOs role could evolve into an enhanced Retail Supply Licensee in the future. This approach would not only ensure sustained rural supply resilience

but also address the residual causative bottlenecks to “Power for All”.

For this, the MGOs would not only have to deliver on the requisite performance but also be monitored for their service performances. Regulators would need to formulate appropriate Standards of Performance for these RESPs to ensure that adequate services are provided to the rural community; in addition, a transparent measurement and verification (M&V) mechanism would need to be in place.

Given the conventional focus on centralized grid electrification as the only reliable and sustainable approach for assuring energy access, the regulatory framework of the past have been inadequate to mainstream DRE mini-grids in the national planning process. Most approaches were limited to pilot-scale implementation models which were mostly grant based. There was also limited appreciation for a sustained policy and regulatory outlook for the mini-grids segment.

The under-developed regulatory environment had previously created significant uncertainty among early



RESPs (Renewable Energy Service Providers) in this sector. There existed considerable ambiguity and opacity in regulation with regard to the operating framework for distribution of electricity on the following issues:

- Alignment on project areas meant for mini-grids
- Outlook on grid connectivity and interactivity frameworks to ensure sustainability of the mini-grid projects, once the main discom grid arrives

Over the last year or so, several measures were undertaken to address these ambiguities. Under the UP mini-grid policy as also the state regulatory framework, there are provisions to authorize RESPs as a franchisee by the Discom as also for grid interconnectivity which will enable a trusted last mile supply management, particularly in peak deficit hours.

A central tenet in these measures, as also in the National Tariff Policy 2016, is the provision for the electricity generated by mini-grids

The framework of mini-grid developers acting as effective and empowered rural utilities represent a framework that can leverage existing investments

to be purchased by the discom, in case of the arrival or intensification of the national grid. This lays the basis for a collaborative and symbiotic construct.

The roadmap to achieving “Power for All”

While the existing national-level policies, such as the DDUGJY, are making massive headway with rapid electrification rates, limiting factors, such as maintenance of last-mile connectivity and the quality

of supplied power can pose a threat to achieving the government’s aim of connecting all households by 2018-19. Also, the fact that productive loads cannot be catered in requisite measures through these plans represents clear limitations to achieving overall rural development, which is the primary intent of the scheme.

On the other hand, with the development of regulations complementary to DDUGJY, such as the National Tariff policy and UP mini-grid regulations, mini-grids have positioned themselves as trusted supply providers or generators who can play a pivotal role in connecting unconnected households along with providing productive loads for economic development. The framework of mini-grid developers acting as effective and empowered rural utilities represent a framework that can leverage existing investments being made for rural electrification and enable “24x7 Power for All” within the stipulated timeline.

