

A Sustainable Power Distribution Model



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Abstract Distribution is the weakest link of the Indian power sector. The last electricity reforms has ampullated the distribution from generation and transmission, but the problem is not evaded. Privatization of Distribution company is being recommended but failures of past cannot be repeated. Majority of the distribution companies has an amalgamation of urban and rural consumers. While urban consumers may find many suitors among private bidders because of better density and better returns, rural consumers may find it difficult to be managed by profit seeking entities. A more “atmanirbhar” or a self-dependent path may suit the rural consumers, for a sustainable power growth. This paper presents an electricity distribution model in which electricity supply is treated as a catalyst of development in rural areas and is treated as a market commodity in urban. It is proposed to separate urban and rural grids. While urban grid be licensed to lowest bidder, rural grid be managed by rural electricity cooperative society (RECS). Each RECS, to source its power from grid as well as from solar plants installed under PM-KUSUM scheme. The power produced to be utilized in battery swapping stations (BSS), for electric vehicles, in such a manner that power flow from grid remains unaffected and commercial transaction compensates for AT&C losses. Urban DISCOM shall bill for the net energy transacted, to RECS at the DTR level through pre-paid meter. The regulatory, technical aspect and financial modelling is dealt in this paper supported by experience in different countries. It also focuses on synergizing of various Government schemes implemented or under implementation.

Keywords Privatization · Rural electricity cooperative society · Prepaid meter · Battery swapping station

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1 Introduction

India has decisively achieved 100% electrification of all its villages and households. The difficult feat was achieved jointly by the effort and funding of Union Government and State Governments. The distribution companies have been handed over with this newly created infrastructure and a mammoth size rural consumer base for maintenance, electricity supply and revenue realization. The rural consumer base is characterized by higher cost of supply, geographical remoteness, dispersed consumer base, low consumption, high leakage and limited ability to pay. Initiatives are being taken to privatize the distribution business with an objective to improve the quality, security, reliability of power supply and consumer service, achieve global benchmarks in AT&C and achieve affordable and reasonable pricing of electricity. It is aimed to shift cost plus, regulated power distribution business to private or public highest bidder.

Past experience in privatization of distribution business has shown mixed results. While outcome in case of Delhi and Mumbai and many other urban cities, with mainly urban consumer base are encouraging [1] while case study of Odisha privatization is far from successful. Apart from many other issues, one noteworthy difference is Odisha has a big rural consumer base. With no special incentive to supply power to rural consumers, profit-seeking private companies usually de-prioritize rural supply. This paper proposes to separate urban grid and rural grid. Urban grids be privatized to the highest bidder, while rural grid be managed by regional co-operative societies, local government institution or ngo. A detail business model is investigated for the management of the co-operative society. A co-operative society that will be entrusted with not only supplying to its rural consumers but also producing power of its own and managing battery swapping stations for EV fleets.

2 Present Issues with Indian Power Sector

2.1 Privatization of Full DISCOM or Urban Areas

In India, many power distribution companies (DISCOM) are suffering from financial and infrastructure challenges. The financial health of most of the DISCOMs are dwindling, with debt ballooning in each passing financial year. The debt restructuring schemes did improve the debt liability, but they have rebounded [1]. The poor financial health of DISCOMs affects all the stakeholders of the power sector vertical. Financially viable DISCOMs are essential to the future stability of India's economy [1]. Government of India, quite rightly, is pushing for privatization of DISCOMs to improve their efficiency. Private sector investment is often believed to be vital for any programme's long-term sustainability [2]. Power sector in India, already, has some experience with privatization of electricity distribution business. Privatization in metro/urban areas have seen considerable success in reducing AT&C losses

and improving consumer satisfaction. At the same time privatization of complete state electricity distribution has not yielded similar results. It is necessary that some course correction be done for better results. Separation of rural grid from the urban grid is proposed. While rural grids be managed by Rural Co-operative society, urban grid be licensed to highest bidder who can deliver power to its consumers at utmost efficiency, reliability and at cheapest price.

2.2 Concern of Rural Electricity Supply

One of the major factors that contribute to the DISCOM's ability to provide reliable and good quality supply is the recovery of revenues from consumers which can be used to strengthen the distribution network and for its periodic maintenance. Because of geographical remoteness of rural households and shortage of manpower with DISCOMs, billing is a major concern [2]. And arrears and poor power quality does not help in revenue recovery. And this vicious cycle continues. A community ownership for the electricity used, certainly lacks. World bank research finds in communities like India, initial rural electrification would not have been economically viable unless subsidized but could independently finance their maintenance and operating cost [2]. India has achieved 100% rural electrification by subsidy from union and respective state governments. It is important that the rural consumers feel responsible towards the assets that has been created and work towards its sustainability. A community centric Rural electricity cooperative society can prove to be a good alternative (Fig. 1).

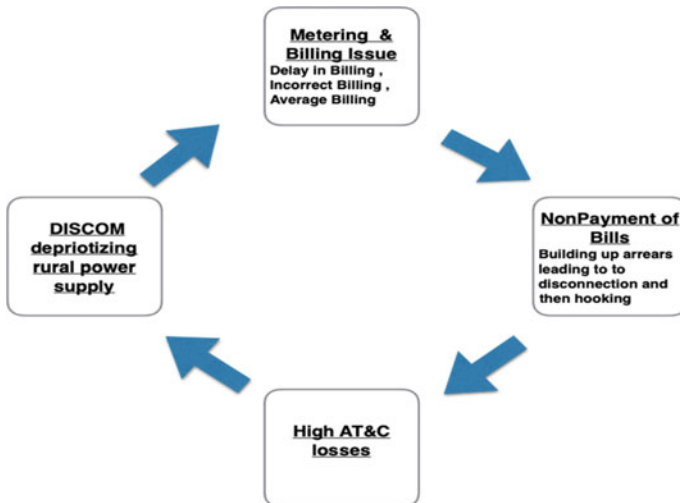


Fig. 1 Vicious cycle in rural electricity supply

3 Proposed Scheme of Rural Electric Supply

The domain of Rural Electricity Co-operative society (RECS) shall start from distribution transformer and downstream till service connections. In the operative area of RECS, power can be tapped from the main 11 kV feeder at various locations through a Pre-paid Net meter. The solar plants commissioned under PM-KUSUM scheme [3] or any others, shall be integrated to grid at various locations along the main Low Tension 3-phase line through a gross meter. All consumers shall be metered. RECS shall own a battery swapping station (BSS) and shall also own a micro finance wing that will finance and help in procurement of Electric autos without batteries. Batteries shall be owned by RECS and be available for hiring at BSS. RECS shall buy power from grid and solar developers. The revenue generated by selling power to domestic households, enterprises and BSS will be used for charging the pre-paid meters and paying solar prosumers. The tariff for all energy transaction will be determined by state regulatory commission. The tariff must have provision of penalty for non-availability grid power (Fig. 2).

The power exchange between the RECS and the distribution company, at the DTR level, shall be through a smart pre-paid meter. The meter, apart from having capabilities that a pre-paid meter already have, will have net meter capabilities, accounting import and export of power, as well. Prepaid arrangement has the potential to bring discipline in revenue collection. Although, consumer meter shall be normal postpaid meters. This arrangement shall rely on the community-led structure for its

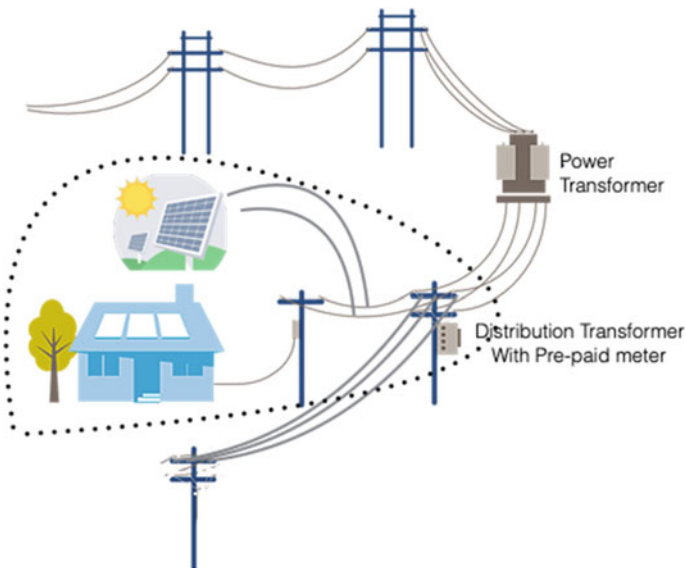


Fig. 2 Jurisdiction of a rural electric co-operative society

efficient and punctual revenue realization from the consumers. It also promises to bring ownership feeling, for the power utilized, among the consumers.

3.1 Urja Mitra: Outage Management

Penalty for non-availability of grid power, due to non-maintenance reasons, will be very relevant and pivotal to the scheme. Loss of grid power will also affect the on-grid solar power generations with financial losses to the producers. The scheduled and non-scheduled power outages must be reported to the consumers through URJA MITRA app [4] of Government of India. RECS will avail the facility of mapping its consumers not only in feeder level but also in distribution transformer level. Presently through URJA MITRA app DISCOMs intimate its consumers about power outages, planned and un-planned, through messages and notification in mobile handset. This initiative has helped DISCOM in generating consumer satisfaction and goodwill.

3.2 Adoption of e-Vehicles in Rural

Electric vehicle (EV) is slowly and strongly gaining traction in India. In (sub)urban areas, adoption of EV is a matter of controlling pollution, preventing resilience on imported crude oil and etc. but in rural, EV is a necessity. Most of the villages in India are, mostly, located far from the fuel retailers and rural mobility rely heavily on the black market, at inflated cost. But villages in India are electrified and EV can be a convenient alternative to fossil oil driven vehicles. The biggest hurdle, in EV adoption lies in high upfront cost. In the proposed scheme, RECS shall maintain a battery swapping station and shall operate by leasing batteries. The consumers can buy electric vehicles, preferably public autorickshaws, not necessarily with batteries. This will reduce the upfront cost of vehicles and increase its affordability. And micro-finance unit of RECS can finance its consumers in buying EVs with or without batteries.

3.3 Commercial Viability

The proposed arrangement has some unique advantages. Major chunk of power will be procured from solar plants whose tariff shall be lower than the procurement tariff. While power is sold in the form of charged batteries at battery swapping station for EV vehicles, at an equivalent tariff higher than procurement tariff, which shall be market driven. The solar power plants and solar pumps installed under PM-KUSUM scheme of Government of India, covered under jurisdiction of the co-operative society, will be encouraged to sell power. In the BSS maintained by RCS, there will be provisions

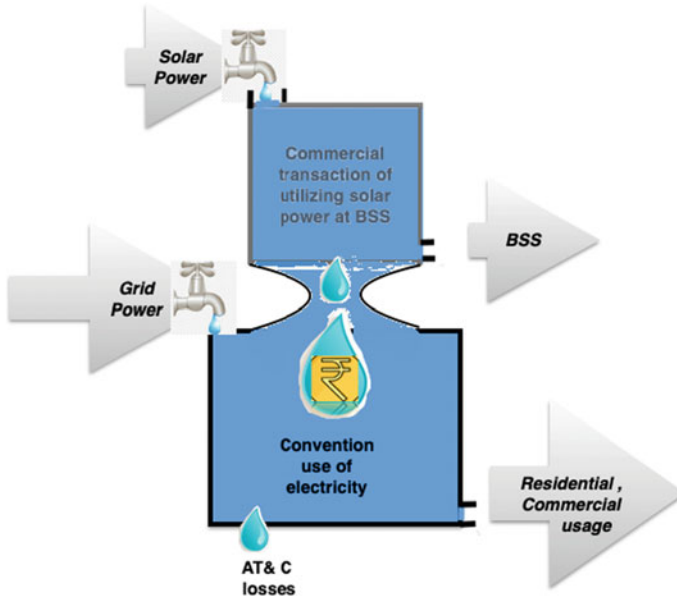


Fig. 3 A typical case of cross subsidy from green power transaction

of DC fast charging the batteries. In the proposed scheme of arrangement, it will be aimed that most of the energy procured from solar is utilized in charging the EV batteries, such that any disruption in load curve due to power flow from grid is prevented. The profit generated out of this transaction will compensate or cross-subsidize any prospective AT&C losses, excluding subsidy, due to distribution of grid power to consumers. While the approved subsidy, primarily be used for procurement and maintenance of assets. And subsidy be availed in the form of loan, backed by respective state Governments, from financial institutions (FI). This shall assure subsidy are given based on merit of works and monitored by FIs while loan repayment is done by state government fund (Fig. 3).

3.4 Subsidy

This paper advocates use of electricity in rural as a catalyst in development while a market commodity in urban. The power be purchased by RECS at a viable bulk supply tariff (subsidized) set by SERC considering the finances of RECS in common. But SERC shall also determine actual cost of supply bulk supply tariff. The differential be recorded and be notified regularly in the public domain. With the use of smart meters, above exercise must get automated.

RECS shall rely heavily on government subsidy for replenishing and creating infrastructure mainly in the form of government loan or loan from financial institution

but backed by state government. This will ensure projects are sanctioned based on its merit and also monitored.

4 Structure of Rural Electricity CoOperative Society

India is not new to the concept of Rural electricity supply co-operatives, though not common. The most relevant being the Mula Pravara co-operative society (MPECS) in Maharashtra. It distributed electricity in 183 villages with a connected load of 207 MW. The Maharashtra regulatory commission has acknowledged its better efficiency over state electricity board (SEB) [5]. MPECS was treated as a licensee and was charged bulk supply rate applicable by the SEB. So, the legal framework for having a democratically governed businesses closely regulated by their consumers and regulatory commission in the form of local co-operative societies already exists in the country. Moreover, rural co-operative societies have proved to be a successful model for rural power electrification and supply in countries as far as United States of America and as near as Nepal and Bangladesh. Rural cooperatives in Bangladesh has gained worldwide recognition as a very successful model for rural energy services delivery with distribution losses around 10% and collection rates around 96% [2]. The society shall be governed by the respective state legislation and can employ engineers, overseers, technicians as per the requirement and fund allotted. RECS will also employ some social mobilizers (SM), whose work will be to educate its members/consumers about their rights wrt electricity distribution and create bridge between members and executive body.

With cooperatives in place there will be need of an overarching body that will provide them with technical assistance and expertise, lobbies for new legislation and advocates the members' interests with policy makers and regulatory commission. In Nepal they have National Association of Community Electricity Users-Nepal (NACEUN) a decentralized membership-based self-regulating body. In Bangladesh they have a government regulatory body in the form of Rural electricity board. India can have best of both the worlds. Electricity supply being a state affair in India, a body similar to NACEUN is proposed that will be a catalyst body between the state regulatory commission (SRC) and cooperatives. Its primary purpose will be to provide capacity building, technical training, administrative and management support for its member organization. It will engage with SRC in policy making and performance-based subsidy allocation to its member cooperatives. And above all it will maintain all records including subsidy disbursement, in public domain.

5 Conclusion

The India of today needs a electrical distribution system which is robust, resilient and above all financially stable. Power for all was achieved by predominantly government

intervention but power 24×7 need community intervention. Proposed model of rural electricity cooperative society gives opportunity to the community to manage its power distribution of its own with strong hand holding by the Government. By providing reliable and cheap electricity and enormous employment opportunity for the locals, it has the potential to bridge the gap of urban and rural divide.

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