Making a case for microgrids

On 30 July 2012, one-fourth of Bharat was plunged into darkness. A blackout that lasted for two days affected all of North and East India and exposed a severe deficiency in the distribution infrastructure and demand management system in the Indian power sector.

While we as a nation mercifully don’t face such major blackouts on a daily basis, the truth is electricity access in India is a case of death by a thousand cuts. Our towns and villages bear the brunt of this poor distribution infrastructure, which is characterized by low voltages, and frequent power cuts, often lasting more than four hours a day.

Employing localized microgrids and reducing dependence on central infrastructure might be the solution to poor distribution infrastructure. And if you asked the folks in Meerwada, Madhya Pradesh, one of the few bright spots North of the Vindhyas on those dark days, they’d agree and point to the small solar microgrid that kept their homes lit and fields humming.

Most of Bharat that lives outside cities suffers from power outages for two big reasons—underestimating demand, and poor balancing of demand and supply. The power infrastructure outside urban centres has been built under the simplistic assumption that a rural household consumes one unit of electricity per day, which, compared to the national average of 12-15 units, is a gross underestimation.

It’s a problem that’s only getting worse with the nation aspiring to better living standards and creating economic opportunities.

It’s the infrastructure-scale equivalent of plugging a geyser into a regular (non-heavy duty) power socket and then wondering why the fuse blew. Lower demand assumption results in infrastructure built for lower capacity that ends up operating at heavy loads during peak hours.

This reduces their operational life and efficiency, increasing events of grid failure. Mismatched demand and supply can also muddle regional and central level planning and result in more power outages.

Distributed local power generation using solar or wind energy could improve the quality of power and provide flexibility in local grid planning and operations for areas outside urban centres. These could be communities or even commercial operations like transportation hubs, warehouses, cell towers or even a substation itself. Distributed generation, otherwise called microgrids, have been around for some time now. But the lack of commercial feasibility has kept them from going mainstream.

However, in the past few years, the cost of solar power has dropped significantly, making solar microgrids increasingly more viable, and bringing with it an ecosystem full of opportunities. It is worth examining these ecosystem building trends and the resulting opportunities in further detail.

First, scale and economics are starting to make sense. Microgrids are commercially viable when two key conditions are met, a threshold scale of 50kW peak power, and customers that are willing to pay higher retail power costs of Rs5 per unit vs. Rs3.25 for the lowest tariff slab. The proximity of a ubiquitous commercial consumer like a mobile tower can help address both conditions.

Commercial consumers usually demand more power and pay more for it, anywhere between Rs6 and Rs11 per unit. Furthermore, consumers in existing microgrids are willing to pay up to Rs6 per unit for reliable power supply, as is evident from projects in Uttar Pradesh, Bihar and Madhya

Pradesh.

Second, the intermittency of solar power is getting addressed. Solar power microgrids cannot operate in isolation and need to be connected to the main power grid as solar power is only available during the day. Microgrids will be commercially successful in those areas with basic grid connectivity, but that experience low voltage and power outages.

Power outages in semi urban and rural areas usually occur around two peak consumption periods—one that occurs a little after noon and one that occurs at dusk. Solar powered microgrids can solve for one of the two peak outages. The addition of storage which currently costs Rs10 per unit, can provide for the second peak. Storage costs are on a downward trend and can drop to a third of today's cost in 5-6 years.

Last, positive trends in policy, economics, and community acceptance is making it easier to solve for land availability. A 50kW solar microgrid can power 100 households and needs less than half-an-acre of land. The key is choosing a suitable consumer—either a community that is already connected to the grid and can lease private land or use community held land around panchayat offices, or a commercial entity with access to land. Larger entities with remote land holdings across India like the Indian Railways, can also deploy microgrids.

That said, an ecosystem of services business needs to be built for micro grids to achieve their true potential. Microgrids, unlike utility scale grids, are owned by small end-users. This creates the need for three types of services. First, the initial set up of the microgrid will require small-scale PMCs (project management companies).

Second, these assets will require operation and maintenance that can be provided by the same type of service provider that serve utility scale solar plants. Finally, we'll need a services company to manage integration, dispatch, and load balancing of several distributed power plants into the grid.

A financing ecosystem to both fund capex and working capital is a key need. The 50kW solar microgrid serving 100 households will need a capex of approximately Rs60 lakh. The payback period for this microgrid will be about 10 years, which is in line with utility scale infrastructure. Thus such grids can avail project finance debt just like other infrastructure projects. So if 80% of Rs60 lakh can be serviced through debt, the user community of a 100-households will have to pay about Rs12,000 per family. This cost structure of the microgrid is more than worth it, given it costs the government Rs30,000 per person to provide electrification and only solves for half of the problem.

Every trend concerning solar power points towards a future where every nook and corner of the nation will able to power itself. In the final part of this three-part series, we will analyse the services and financing opportunities that are crucial to enabling this bright and sunny future.

Vaidhehi Ravindran and Vignesh Nandakumar are venture capital investors at Aspada Investment Advisors. The Bharat Rough Book is a weekly column on building businesses for the mass markets represented by the middle of India's income pyramid.

END