Powering agriculture via solar feeders

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Two-thirds of the total irrigated area in India uses groundwater pumping, powered by more than 2 crore electric and 75 lakh diesel pumps. Access to groundwater depends on reliable and affordable electricity supply. This is an important issue as it concerns livelihoods of the rural poor and food security of the country. Agriculture is a major consumer of electricity, accounting for nearly one-fourth or one-third of consumption in many states.

Since the 1970s, agriculture in many Indian states has been receiving electricity with either low tariffs or for free. Much of this supply is unmetered. Due to the lower tariff and poor revenue collection, agricultural sales are often seen as a major reason for the financial losses of Distribution Companies – or DISCOMs. Part of this loss is then recovered through higher tariffs for other consumers like industry and commercial (called cross-subsidy), and the remaining through direct subsidy from the state governments. Because it is seen as a loss-making sector, agriculture often gets poor quality supply leading to problems such as frequent pump burn-outs and power failures. Restoring supply takes a lot of time and so does getting new connections. Further, the supply is unreliable and often available during late nights. All these factors make farmers distrustful of DISCOMs.

Electricity demand for agriculture is expected to double in the next ten years and as the average cost of supply keeps increasing, the problem of agriculture subsidies will become worse. Unless new ideas are tried out, the quality of electricity supply to agriculture will further worsen. Any solution must first provide reliable, adequate day-time electricity supply to farmers at reasonable tariff, leading to a gradual increase in the mutual trust between the DISCOM and the farmer. This should also reduce the subsidy requirement for it to be truly scalable across the country.

Three ongoing developments allow for an exciting possibility. One, low cost electricity from solar, at Rs 2.75-3/unit and at a fixed price contract for 25 years due to absence of any fuels is already a reality. Second, states have to exponentially increase their solar procurement to fulfill the national objective of increasing the use of solar power. Finally, the grid has reached every village in India and agriculture feeder separation, where lines carrying electricity to pumps and villages are physically separated, has progressed significantly, with nearly two third of the target completed.

An innovative program taking advantage of these developments has started in Maharashtra under the aegis of the '*Chief Minister's solar agriculture feeder program'.* A solar agriculture feeder is essentially a 1-10 MW community scale solar PV power plant, which is interconnected to the 33/11 kV sub-station. A 1 MW solar plant can support around 350, 5 hp pumps and requires around 5 acres of land to set up. The plant can be set up in few months and there is no change at the farmer's end. Pumps need not be changed and farmers do not have to take responsibility of installation and operation. All the pumps connected to the separated agriculture

feeder will be given reliable day-time electricity for 8-10 hours between 8 am - 6 pm. When solar generation is low, maybe due to cloud cover, balance electricity can be drawn from the DISCOM. Alternatively, when pumping demand is low, maybe during rains, excess solar electricity will flow back to the DISCOM. This allows for optimal sizing of the power plants. Project developers are selected through a competitive bidding process and the entire electricity would be bought by the DISCOM through a 25-year contract. The DISCOM would continue to distribute the electricity to farmers on concerned feeders.
The major advantages of this approach are that apart from ensuring day-time reliable power for the farmers, it requires no capital subsidy from the government. Rather, it is cost-effective, thereby enabling reduction in subsidy. Additionally, no new large transmission lines are needed, which has become a bottle-beck for various large scale wind and solar power tenders. Deployment is possible under the existing regulatory framework, and the generation also qualifies for Solar RPO of the participating DISCOM. Finally, this approach can also provide distributed jobs to local youth in construction, operation and maintenance of the plant. After demonstrating benefits of this approach, future programs could link deployment of such solar feeders to: reduce unauthorized use/connections, improve metering and tariff recovery, energy efficient pumps, water saving approaches etc.

Presently, solar plants with overall capacity of around 2000-3000 MW are under various stages of tendering and implementation under this scheme in Maharashtra. This is equivalent to supplying solar power to 7.5 lakh pumps, of 20% of the pumps in Maharashtra. As of December, 2018 nearly 10,000 farmers are already getting reliable daytime power under this scheme and the DISCOM is planning to scale this significantly beyond initial target of 7.5 lakh in next three to five years. While the cost of supplying power from the state DISCOM is about Rs 5/unit and rising each year, the price for solar power is about Rs 3/unit, fixed for 25 years. This saving of about Rs 2/unit translates to an annual saving of Rs 10,000/five hp pump. For a typical feeder with 500 pumps, this would save Rs 4.5 crore (in net present value terms) over 20 years. The government of India has proposed a similar scheme at the national level, namely KUSUM with a 10,000 MW target.

The availability of the electricity grid in every village coupled with the national feeder separation program makes this cost-effective and rapidly scalable approach imminently feasible across the nation. The urgent need for providing agriculture with reliable and affordable day-time electricity makes it imperative for the sector to adopt such an approach. This policy framework, a win-win-win situation for the farmers, government and DISCOMs, offers a much needed farmer centric yet fiscally prudent pathway for the power sector.

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