OPINION: Sowing the seeds of a solar power revolution via agro photovoltaics

APV, while safeguarding traditional livelihood, creates new income avenues for farmers and government initiatives like PM-KUSUM can act as catalysts to take this model forward.

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New Delhi: With a large part of the world in lockdown, most businesses have come to a

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standstill. The solar industry is no exception. Owing to heavy dependence on Chinese photovoltaic (PV) modules, India's 100 GW solar target for 2022 may be impacted. This is because importing these modules will likely cost more in the near future due to manufacturing and logistics issues. However, this present lull in solar power development allows the country to strategically plan growth post this apocalyptic
scenario.

Most of our success stories in solar arise from large solar parks (over 50 MW) with tariffs below INR 2.5/kWh. However, use of large renewable energy projects leads to fluctuations in power generation and requires balancing mechanisms for the grid. It is logical to focus on smaller plants close to existing infrastructure and with immediate demand in vicinities. These will also avoid higher transmission costs over long distances.

Agriculture Sector

One such opportunity is the agriculture sector, which accounts for around 18% of India's electricity

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major chunk of this is supplied at no cost to the farmers. A combined annual outlay of ariund Rs 100,000 crores is disbursed by state governments to distribution companies (DISCOMs) as compensation. Initial estimates show that around 130 GW of solar power can serve the entire agriculture load with smaller ground-mounted plants (1-10 MW). The cost for a phased implementation over 5 years would be around Rs 525,000 crores. This can be recovered in less than 6 years per plant with an internal rate of return (IRR) of around 20%. In the long-term, this is economically judicious, as it saves state governments the trouble of paying DISCOMs annual compensation packages. It also facilitates the entry of new players since big developers tend to focus on larger projects. State generation companies looking to diversify their renewables portfolio and downscale coal, are well suited to exploit this opportunity.

Presently, farmers get staggered power supply for 7 hours a day – 4 hours during daytime and 3 hours at night (or vice versa). Solar-based power generation can cater to farmers' demand continuously during the day, making it easier to irrigate their lands.

Several plausible ideas have been mooted at state and central levels to link solar with agriculture. Smaller ground-mounted solar plants (1-10 MW) are being connected directly to dedicated agricultural feeders in some states. Greenhouses with solar roofs are being tested to increase yield and revenue for the rural population. Standalone

the country. Canal-top solar installations to prevent evaporation of water and improve the performance of panels have also been evaluated. Pilots have met with varying degrees of success, with no concrete plans yet to scale up these concepts nation-wide.

Agro Photovoltaics

A unique model of collocating food and fuel is being explored at the upper echelons of India's renewable energy sector. Agro Photovoltaics (APV) involves solar panels being installed at a certain height above existing cropland. Spacing between crop rows might be larger than normal cases, leading to reduced crop yield. However, revenue from electricity generation and sales can offset this loss. APV is particularly beneficial for states which are lagging behind in their solar targets. Most of these states have shortage of available land due to the presence of highly fertile plains used for agriculture. These include the northern and eastern plains of India, which also receive favourable solar insolation for electricity generation.

There are concerns about shadow created by the panels and the subsequent choice of suitable crops in APV. However, these can be addressed during the system design phase of each project. While planning a project, microclimatic conditions along with soil characteristics can be studied to decide the suitability of crops. Farmer inputs will have to be factored in before changing the cropping patterns. Technical parameters for solar plants such as optimal height, row spacing, panel choice,

Legal provisions regarding dual-land use in this model also requires careful assessment, and steps should be taken to avoid disputes.

APV pilot projects have been successful across India. A study at a grape farm in Nashik showed a hike in annual revenue by over 15 times. Central Arid Zone Research Institute carried out similar projects in Jodhpur and Bhuj. A recent study by Fraunhofer Institute for Solar Energy Systems (ISE) at Paras, Maharashtra looked at shade-loving plants (tomato and cotton) with PV. These had favourable results in terms of revenue, rainwater harvesting and prevention of soil degradation. Electricity generation from panels in these plants have followed norms as well.

Thus, APV, while safeguarding traditional livelihood, creates new income avenues for farmers. Government initiatives like Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) can act as catalysts to take this model forward. Thus, our underserved farmers will be encouraged to become active stakeholders in India's solar revolution.

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