How well is India tapping its rooftop solar potential?

-Shantanu Roy

Rooftop solar (RTS) has the potential to revolutionise India's energy landscape, offering a sustainable, decentralised, and affordable solution to meet the country's growing electricity needs and making consumers self-reliant. The country's installed RTS capacity increased by 2.99 GW in 2023-2024, the highest growth reported in a year. As of March 31 this year, the total installed RTS capacity in India was 11.87 GW, per the Ministry of New and Renewable Energy. To meet rising energy demand, India needs to double down on its efforts to expand its RTS potential.

What is the RTS programme?

The Indian government launched the Jawaharlal Nehru National Solar Mission in January 2010. It was the first major initiative to promote the growth of solar energy. The main objective was to produce 20 GW of solar energy (including RTS) in three phases: 2010-2013, 2013-2017, and 2017-2022.

In 2015, the government revised this target to 100 GW by 2022, including a 40 GW RTS component, with specific yearly targets for each State and Union Territory. In December 2022, India achieved an installed RTS capacity of about 7.5 GW. It extended the deadline for the 40 GW target to 2026.

Over the years, improvements to the RTS installation numbers have been driven by favourable initiatives (e.g. the Sustainable Partnership for RTS Acceleration in Bharat, SUPRABHA, and the Sustainable Rooftop Implementation for Solar Transfiguration of India, SRISTI, schemes), financial incentives, technological advances, awareness campaigns, and training programmes.

Nonetheless, there is a long way to go. The overall RTS potential of India is approximately 796 GW. The full RTS potential of several States is yet to be fully tapped. To meet India's ambitious target of installing 500 GW of renewable energy capacity (with a solar component of 280 GW) by 2030 and its larger net-zero goals by 2070, RTS alone needs to contribute about 100 GW by 2030.

How are the States faring?

Based on the RTS capacities calculated as of March 31, 2024, Gujarat, Maharashtra, and Rajasthan have taken big strides, while some others are behind the curve. An installed RTS capacity of 3,456 MW in Gujarat is the result of its government's proactive stance and a quick approval process, a large number of RTS installers, and high consumer awareness. Modhera, India's first solar-powered village, is in Gujarat and has 1,300 RTS systems of 1 kW each.

Similarly, Maharashtra, with an RTS capacity of 2,072 MW, is one of the top performing states owing to its robust solar policies and conducive regulatory environment.

Being the largest state by land area and with a high solar irradiance, Rajasthan boasts of the highest RTS potential in the country, with a capacity of 1,154 MW. The State's efforts to streamline approvals, provide financial incentives, and promote RTS through public–private partnerships have spurred this growth.

Kerala, Tamil Nadu, and Karnataka, with respective installed capacities of 675, 599, and 594 MW, have also performed reasonably well.

However, Uttar Pradesh, Bihar, and Jharkhand (among others) are yet to fully explore their RTS potential. The challenges here include bureaucratic hurdles, inadequate infrastructure, and lack of public awareness.

Parts of the 'Muft Bijli Yojana' scheme

The 'Pradhan Mantri Surya Ghar: Muft Bijli Yojana' is a flagship initiative to fit 1 crore households with RTS systems and help them get up to 300 units of free electricity every month. An average system size of 2 kW for the targeted households will result in a total RTS capacity addition of 20 GW.

The scheme has a financial outlay of Rs 75,021 crore, which includes Central financial assistance for consumers (Rs 65,700 crore), incentives for distribution companies (Rs 4,950 crore), incentives for local bodies and model solar villages in each district, innovative projects, payment security mechanisms, capacity building, awareness, and outreach.

To address the paucity of trained professionals in the solar industry, the government has set aside Rs 657 crore for capacity-building under the scheme to create a skilled workforce capable of installing, operating, and maintaining RTS systems. The scheme also encourages the adoption of advanced solar technologies, energy storage solutions, and smart grid infrastructure to enhance the efficiency, reliability, and resilience of RTS installations.

Finally, the scheme allocates Rs 657 crore for awareness and outreach. By targeting households across rural and urban areas, the initiative prioritises regions with limited access to electricity, high solar potential, and vulnerable communities, to ensure an equitable distribution of benefits.

The Indian government intends to streamline approvals, permits, and regulatory clearances for RTS installations, reducing administrative hurdles and promoting ease of business.

How can we ensure RTS growth?

Creating awareness is key to getting consumers on board. Grassroots-level awareness campaigns led by distribution companies and local bodies, along with door-to-door RTS promotion campaigns, are required to cover the nation. These initiatives should be strategically planned for long-term implementation and with clear targets for each ward, subdivision, taluk, city, and district.

Second, RTS needs to be economically viable for households. While government subsidies are helping lower the total cost for households, multiple low-cost financing options are required. The number of banks and non-bank financial companies providing RTS loans has increased of late. Access to low-cost RTS loans should be as easy as getting a bike or car loan. With ample loan options in the market, more consumers will be willing to make the solar leap.

Third, promoting research and development in solar technology, energy storage solutions, and smart-grid infrastructure can drive down costs, improve performance, and enhance the reliability of RTS systems. For example, technology solutions can help streamline RTS adoption using drone and/or satellite imagery to analyse shadow-free areas on rooftops; building patterns, height, and density; and energy consumption trends. Such solutions can provide accurate feasibility assessments and optimal RTS system designs to stakeholders, and help identify suitable rooftops to achieve the 1-crore target.

Fourth, investments in training programmes, vocational courses, and skill development initiatives will help build a skilled workforce. Under the 'Suryamitra' (solar PV technician) training programme initiated in 2015, more than 51,000 technicians had been trained as of December 2022. Such programmes should be accelerated to support the RTS infrastructure.

Fifth, as the implementation of the 'Muft Bijli Yojana' goes into full swing, RTS policies including net-metering regulations, grid-integration standards, and building codes should be reviewed and updated. This will help address emerging challenges and facilitate the scheme's smooth implementation. In particular, the virtual net-metering and group net-metering options need to be fast-tracked for consumers with inadequate roof space for RTS installations.

With the right push, India can unleash the full potential of RTS and accelerate its transition towards a clean energy future.

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