

Options to tie solar energy with electric vehicle charging

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A solar rooftop photovoltaic (SRTPV) system can be integrated with an electric vehicle charging station (EVCS) by installing panels within the charging station premises (on-site) or by sourcing the solar energy effectively from panels that are located outside (off-site) the premises via an electrical grid. Several pilot demonstrations that have been reported so far are primarily on-site systems. Though SRTPV technology serves as a cheaper energy source than the grid, especially for the commercial consumer category, a major drawback of co-locating it with an EVCS is the high upfront costs of solar panels. This problem can be overcome by effectively sourcing the cheaper solar energy from an off-site entity that bears the initial investment for solar panels. Such business models are referred to as **energy-as-a-service models**. Policy and regulation will play an essential role in enabling such mechanisms.

Here are some measures that explore the off-site sourcing of solar energy for electric vehicle (EV) charging.

Net metering and its variants

The net-metering policy has played a crucial role in driving SRTPV adoption worldwide. Under this policy, an SRTPV adopter can use the electrical grid as a virtual battery to exchange energy with the grid within billing cycles. The policy helps end-users defer investments on a dedicated energy storage system, thereby reducing the cost of the generated solar energy. **However, it is facing backlash from utilities.** They stand to lose considerable revenue from consumers, particularly in the commercial and industry sectors. Nevertheless, the net-metering policy will be instrumental in reducing operational (energy) costs of EVCSs—with on-site SRTPV systems—and promoting clean charging mechanisms.

Such accounting methods can also play a vital role in enabling off-site solar energy sourcing. Variants of net metering such as virtual and group net metering are two such mechanisms. In virtual net metering, a single EVCS or multiple EVCSs can hold ownership stakes in an off-site SRTPV plant (e.g., installed by a community) and use the number of units of energy generated to offset the local energy consumption at charging stations. Group net metering is similar to virtual net metering, except that the surplus energy (generated elsewhere) exported to the grid is used to offset the local consumption. Such arrangements enable businesses with a lack of sufficient rooftop area or solar resources to access energy from solar-rich remote sites, thereby effectively integrating the two technologies.

Currently, such metering mechanisms have been implemented at limited locations (e.g., Delhi) in India.

Open access

Under their respective renewable energy (RE) policies, many states permit solar developers to sell the generated energy directly to electricity supply companies (ESCOs) or consumers who can purchase power at a scale of at least 1 MW. Though this benefits buyers as costs are lower than when buying from ESCOs, it limits the consumers to those whose power demand are above 1 MW.

Bus depots or EV fleets for captive charging, which see high demand, can benefit from this option.

Green energy certificates

Recently, Maharashtra approved a scheme that allows all consumers of Tata Power to source green energy to meet their complete demand. The consumers under the scheme will have to pay a premium of INR 0.66/unit and receive a monthly certificate assuring them of their energy being sourced from green energy. EV fleet operators or businesses who do not have the resources to generate solar energy or are ineligible for open access and are committed to using renewables in fulfilling their sustainability goals can benefit from such a mechanism.

Peer-to-peer energy trading

Peer-to-peer (P2P) energy trading represents a novel market mechanism where solar energy producers (usually of any capacity) and consumers can trade energy directly among themselves. P2P trading benefits sellers of green energy by enabling them to sell energy at a price higher than the generation cost. Buyers (EV charging businesses) also find it beneficial as they get access to cheaper and cleaner energy. However, it is important to find a win-win scenario for all stakeholders, including ESCOMs.

Policy and regulatory changes are required because direct selling and buying of energy are currently not allowed in India.

A few pilot projects are being trialled in Uttar Pradesh and Delhi. The recent Karnataka Renewable Energy Policy draft (2021–26) also considers exploring such P2P energy projects within the state, which is an encouraging step.

India has set ambitious targets for both renewables and EV adoption in the coming years. However, well-defined **policy measures that enable renewable energy-based EV charging have not been framed yet**. The measures discussed above can be tailored to suit the needs and preferences of different consumers. More importantly, they rely minimally on subsidies. Policy and regulation will play a significant role in enabling these mechanisms.

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