Modernizing the Grid - South India's 2025 Renewable Energy Reforms

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The Renewable Energy Regulations 2025, recently proposed or implemented in Kerala, Karnataka, Andhra Pradesh, Telangana, and Tamil Nadu, represent a significant departure from traditional energy management. These frameworks prioritize grid resilience and consumer empowerment by integrating cutting-edge technologies such as Battery Energy Storage Systems (BESS) and blockchain-based Peer-to-Peer (P2P) trading into the heart of the distribution network. By expanding beyond basic rooftop solar to embrace complex models like Virtual and Group Net Metering, these regulations aim to democratize clean energy access while maintaining the technical stability of an increasingly decentralized grid.

The Kerala State Electricity Regulatory Commission (KSERC) has proposed the Renewable Energy Regulations 2025 to modernize Kerala's renewable energy sector and align it with national net-zero goals. The regulations focus on improving grid stability through battery storage and pumped storage, ensuring fair billing with category-wise net metering limits, and requiring the Kerala State Electricity Board to prepare a long-term Resource Adequacy Plan.

Analysis of the Regulatory Framework for Renewable Energy in Kerala

Net metering

For domestic consumers, the maximum permissible plant capacity is 20 Kw.
The installed capacity shouldn't exceed the connected load (kW) for load-based billing or contract demand (kVA) for demand-based consumers.

- The permissible capacity ranges are:
- Domestic (1 kW to 20 kW)
- Industrial (1 kW to 500 kW)
- Agriculture (1 kW to 3000 kW)
- Common Area Services for residential buildings (1 kW to 500 kW)

For industrial consumers the maximum permissible plant capacity shall be 500 kW,also systems between 25-100 kW require 10% storage, and those above 100-500 kW need 20% storage
For common area service connections of residential high-rise/ multi-storied buildings and residential colonies, the maximum plant capacity of the REGS shall be 500 kW Systems from 25-100 kW need 10% storage, and 100-500 kW systems need 20% storage.

Virtual net metering system

- Those who are eligible for VNM are multi-storied buildings with 20% storage,low-income domestic consumers sponsored by government,government offices/institutions in LSGI areas with 20% storage, MSMEs (up to 10 kW) with 20% storage, and agricultural consumers
- The Lead person sets up the DRE plant and gets a separate connection for it. They pay for the connection costs, including any upgrades needed for the distribution transformer. If the plant is 50 kW or more, and the existing transformer can't handle it, they'll upgrade or install a new transformer.
- The DRE plant capacity under VNM ranges from 10 kW to maximum plant capacity shall be lower of:
  (i) 1000 kW;
  (ii) the cumulative connected load/ contract demand of the participating consumers
  (iii) the cumulative maximum capacity share of the participating consumers

Group Net metering

All consumers/ prosumers eligible for net metering as specified shall be eligible to install RE generating system RE generating system under GNM at single or multiple premises. The share of capacity of the RE plant for each of the premises of the consumer shall not exceed the limits specified under net metering regulation. Surplus electricity generated every month can be carried forward and offset against consumption in subsequent months until the end of the financial year .The rate for settlement of surplus banked energy in respect of existing prosumers under GNM by any name, shall be APPC rate of Rs 3.08/- per kWh and for new prosumers shall be Rs 2.79/- per kWh (Solar) and Rs 2.87/- per kWh (Wind).Grid Support Charge levied from each of the consumers/ prosumers under Group Net metering system on the energy consumed by the prosumer from the grid during the non solar hours.

Vehicle to Grid

Time-of-Use tariff introduced to encourage V2G participation, offering incentives for energy export during peak demand periods. Initially the tariff of Rs 10.00 /- per kWh shall be applicable for export of energy from V2G systems during peak hours

Peer to peer

Prosumers can sell excess RE energy via an online platform (blockchain tech), operated by a regulated provider or Distribution Licensee. The Licensee ensures grid stability.

Net Billing

For Net Billing, the minimum plant capacity is 1 kW, while the maximum capacity is limited to the connected load for load-based consumers, the contract demand for demand-based consumers, or 1000 kW, whichever is lower However, if the prosumer installs an energy storage system with a capacity of at least 30% of the plant's energy generation potential, the maximum allowable plant capacity increases to 3000 kW .

Gross metering

All consumers and prosumers are eligible to opt for Gross Metering with a minimum plant capacity of 1 kW and a maximum of 3000 kW. Notably, an applicant can set up a DRE plant in an area that is not within their own premises and still be eligible for Gross Metering by obtaining separate connectivity.prosumers who install energy storage systems will be eligible for a higher feed-in tariff, as determined by the Commission, for energy injected into the grid during peak hours

Renewable energy regulations of Andhra Pradesh

The Andhra Pradesh Electricity Regulatory Commission (APERC) introduced reforms in tariffs, rooftop solar, green open access, renewable energy banking, and battery storage to support clean energy while ensuring grid stability. Banking is settled within the billing cycle based on Time-of-Day slots with priority use of peak-hour energy, and grid-connected BESS projects must have at least 1 MW capacity with four hours of storage.

Analysis of Rooftop Solar regulation

Net metering

Minimum capacity for Grid-Interactive SRTPVS with/ without Battery Energy Storage System under Net/Gross metering to be installed at the premises of any individual prosumer shall not be less than 1 kWp.All the consumers installing the SRTPVS have to bear the cost of Gross/Net Meter. For domestic solar users, the feed-in tariff decided by the Commission applies for 25 years under Net and Gross metering.Grid-Interactive SRTPVS with/ without Battery Energy Storage System under the Net Metering framework to be installed by any consumer(s) shall not be more than 500 kWp or the contracted demand(s) whichever is less

Gross metering

The capacity for Grid-Interactive SRTPVS shouldn't exceed 5000 kWp or the contracted demand, whichever is lower.In Gross Metering, the DISCOM pays for

excess energy exported to the grid at a feed-in tariff. This payment offsets the prosumer's energy consumption bill. If export exceeds consumption, the DISCOM pays the prosumer the excess amount.

Wheeling charges

No Transmission and Wheeling charges & losses shall be collected from the prosumers under the Gross/Net Metering, wherever the SRTPVSs and Consumption are at the same point of the grid. In other cases, 5% of energy injected into the grid by SRTPVSs in kind shall be collected/adjusted towards T&D charges and losses.

Renewable energy regulations of Telengana

The Telangana Electricity Regulatory Commission (TSERC) is the statutory body responsible for regulating electricity generation, transmission, distribution, and supply within the state of Telangana. TSERC has played a key role in shaping policies that support sustainable power development, promote renewable energy adoption, and ensure reliable and affordable electricity for consumers.

To accelerate the transition toward clean energy, TSERC has introduced several forward-looking regulations and reforms covering rooftop solar, green energy open access, renewable purchase obligations (RPO), and energy accounting mechanisms. One of its major initiatives is the Rooftop Solar PV Grid-Interactive Systems Regulation, 2025, which replaced the earlier 2016 framework and introduced multiple metering mechanisms such as net metering, group net metering, gross metering, and virtual net metering to expand consumer participation in solar power generation.Main of them are listed below

Net Metering

The minimum size of a grid-connected rooftop solar system for both net metering and gross metering is 1 kWp. All electricity consumers, except those with temporary connections, can install a rooftop solar PV system under net metering with a capacity of up to 500 kWp.

Consumers who already installed rooftop solar systems larger than 500 kWp and are currently using net metering will continue to receive the same benefit under these regulations.

Group net metering

For residential and government consumers, the total solar capacity shouldn't exceed the total connected load of the main user and all participating connections combined

For Industrial, Commercial and Others, solar capacity can be up to 80% of the total connected load of the main user and participating connections combined.If load reduces later and solar capacity is more, excess energy injected is treated as 'inadvertent power'.

Gross metering

The eligible consumer of all categories except temporary supply category may install the Rooftop Solar PV System under the Gross Metering Arrangement up to 1 (one) MWp capacity.

Virtual Net metering

The eligible consumer of all categories except temporary supply category can install the Rooftop Solar PV System under the Virtual Net Metering Arrangement for less than 100 kwp capacity.

Green Energy Open Access Regulations, 2024

The Telangana State Electricity Regulatory Commission issued the Open Access Regulation, 2024 to align with the Green Energy Open Access Rules, 2022. It allows consumers with ≥100 kW load to buy renewable energy from captive or third-party generators and bank surplus energy within the billing month.

Banking of Renewable Energy Generation

Consumers using Green Energy Open Access (GEOA) can store (bank) any extra renewable energy they generate after meeting their own needs. Banking is done on a monthly basis and comes with an 8% charge on the energy stored. At least 30% of a consumer's monthly energy use can be banked.

Energy stored during peak hours can be used later in both peak and off-peak hours, while energy stored during off-peak hours can only be used in off-peak hours.

Renewable energy regulations of Tamilnadu

Tamil Nadu is already recognised as one of India's leading renewable energy states. It consistently ranks among the top states for installed wind energy capacity and has

achieved record levels of wind and solar contribution to the grid, at times meeting more than half of the state's daily electricity demand from these sources alone.While rooftop solar adoption still has room to grow, recent state policies and campaigns have encouraged greater household and commercial uptake, supported by streamlined net-metering regulations are ;

Net metering

All domestic consumers are eligible for Net metering mechanism up to the level of sanctioned load/ contracted demand of their service connection irrespective of voltage level
Domestic consumers have an additional option of choosing the net billing Mechanism Domestic consumers who have been provided with the solar net billing facility shall have option to migrate to the net-metering mechanism.

Net billing

All categories of consumers (except Hut & Agriculture) irrespective of load, tariff and voltage level are eligible for net billing or net feed-in mechanism up to the level of sanctioned load / contracted demand of their service connection (999kW whichever is lower.)

Net work charges are leviable for the total energy generated in Net metering and Net billing or Net billing mechanisms. Net work charges are not applicable to Gross metering mechanism.

Gross- metering:

The existing and new consumers of all categories except Low Tension category up to 150 kW and generators are eligible for gross metering mechanism irrespeclive of tariff. The minimum size of the Solar System that can be set up under Gross Metering mechanism shall be 151 kW up to a maximum capacity of 999 kW.

Settlement Period

The period runs from April 1st to March 31st. In net-metering, any surplus credit at the end of the settlement period lapses. In net-billing, consumers may receive payment for net credit or carry it over to the next period.

Renewable energy regulations of Karnataka

The Karnataka Electricity Regulatory Commission (KERC), established in 1999, is the primary body responsible for regulating the power sector in Karnataka. By analyzing the KERC (Implementation of Solar Rooftop Photovoltaic) Regulations and the more recent Green Energy Open Access (GEOA) 2022 and Open Access 2025 frameworks, a clear picture emerges of the state's aggressive shift toward a green grid.

Implementation of Rooftop aero turbine with solar or without solar

Hybrid RAT systems can reach 1.25 times the sanctioned load, with the primary resource capped at 100% and the secondary at 25%. Standalone RAT plants must be at least 1 kW and cannot exceed the sanctioned load. For grid stability, installations up to 150 kW are limited to 80% of the transformer's rated capacity , while larger plants must not exceed 80% of the line's current carrying capacity.

Peer to peer

When the cumulative capacity of P2P solar transactions reaches 100 MW, participants must follow strict scheduling protocols where next-day energy trades are submitted by 5:00 PM and same-day trades are scheduled at least one hour in advance. Once these specific deadlines for day-ahead or intraday transactions have passed, the energy schedule becomes final and no further changes or deviations are permitted.

Virtual net metering

Domestic Consumers, group housing societies, institutions run or managed by charitable Institutions/organisations, government buildings including schools, buildings belonging to local authorities shall only be eligible to install Solar plants under virtual net metering arrangements.The minimum size of solar plant that can be set up under virtual net metering arrangements shall be 5 kW. The maximum size shall not exceed the combined sanctioned load or contract demand of all the participating consumers.

Group net metering

Consumers of all categories shall be allowed to install Solar plant under group net metering arrangement. The minimum size of Solar plant that can be set up under group net metering shall be 5 kW, while the maximum size shall not exceed the combined sanctioned load or contract demand of the consumer's installations.Settlement of Excess Energy Purchased by the Licensee at 75% of the generic tariff determined by the Commission.

Conclusion

The regulations represent a shift from passive rooftop solar adoption to an active, decentralized energy ecosystem. By integrating mandatory storage, VNM, and digital trading platforms, these states are addressing the technical challenges of renewable energy intermittency while maximizing consumer participation. This framework not only supports local energy security but also aligns state policies with India's broader commitment to a sustainable, green grid.