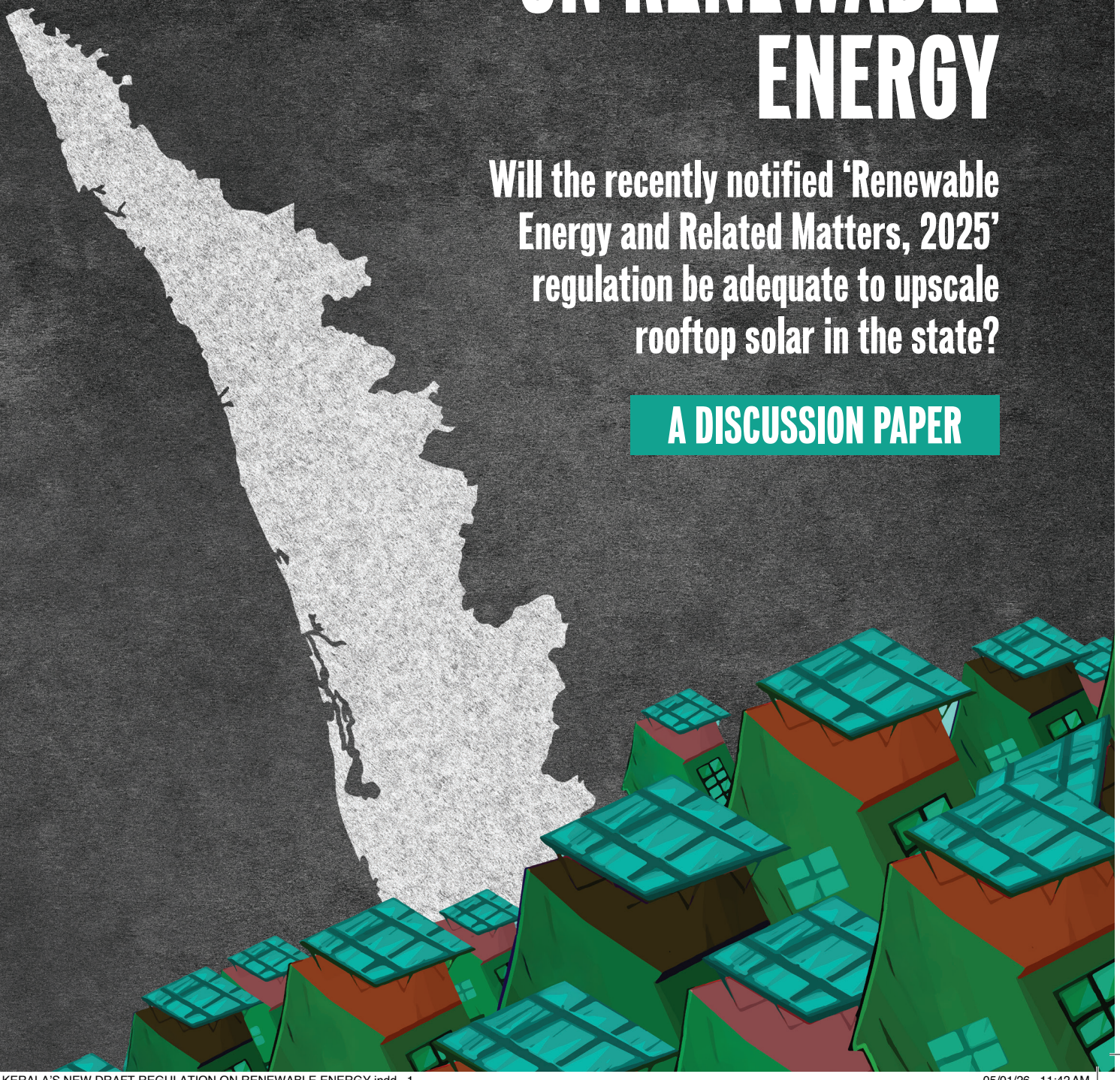
KERALA'S NEW DRAFT REGULATION ON RENEWABLE ENERGY

Will the recently notified 'Renewable Energy and Related Matters, 2025' regulation be adequate to upscale rooftop solar in the state?

A DISCUSSION PAPER



KERALA'S NEW DRAFT REGULATION ON RENEWABLE ENERGY

Will the recently notified 'Renewable Energy and Related Matters, 2025' regulation be adequate to upscale rooftop solar in the state?

A DISCUSSION PAPER

Research direction: Nivit Kumar Yadav

Author: Arvind Poswal

Editor: Souparno Banerjee

Cover and design: Ajit Bajaj

Layout: Kirpal Singh

Production: Rakesh Shrivastava and Gundhar Das

The Centre for Science and Environment is grateful to Bread for the World (BfW) for their support.

The Centre for Science and Environment is grateful to the Swedish International Development Cooperation Agency (Sida) for their institutional support.

Citation: Arvind Poswal 2026. *Kerala's New Draft Regulation on Renewable Energy*. Centre for Science and Environment, New Delhi

Published by
Centre for Science and Environment
41, Tughlakabad Institutional Area
New Delhi 110 062
Phone: 91-11-40616000
Fax: 91-11-29955879
E-mail: cse@cseindia.org
Website: www.cseindia.org

Contents

Executive Summary

Kerala's rooftop solar programme: Success leads to new challenges

Driven by progressive policies and a high share of renewable energy (RE) in its installed capacity, Kerala has emerged as a frontrunner in rooftop solar (RTS) adoption in India. But the state's success in scaling up the programme has had an unwelcome result: it led to financial stress on the electricity distribution company which, in turn, resulted in regulatory changes. There are apprehensions that these changes can impede the programme itself.

The question is, what then is the way ahead? This question applies to Kerala and to other states of India as well, as more and more households adapt solar rooftop systems, contributing to higher costs of power procurement during evening peaks as well as in management of excess power available during daytime.

Progress of the rooftop programme in Kerala

- **Early adoption and scale:** Kerala was one of the earliest adopters of solar energy regulations (2008) in India, and mainstreamed grid-interactive rooftop solar from 2014 onwards. The state has also been proactive in procurement of RE-based power and has set ambitious targets for RE integration.
- **Flagship initiative:** The state's flagship Soura Programme (KSEB), launched in 2019-20, has been a key catalyst. It aimed to add 1,000 MW of solar power, with 500 MW from rooftops, utilising different business models like RESCO and CAPEX to attract consumers.
- **Household reach and penetration:** A crucial feature, net metering, allowed consumers to export surplus energy to the grid, reducing their bills and—in some cases—earning them credits. As of August 2025, Kerala has an installed RTS capacity of 1.51 gigawatt (GW). With approximately 1.8 lakh (0.18 million) RTS installations out of a total consumer base of about 1.05 crore (10.5 million), the state has nearly 2 per cent RTS penetration. It is among the top five states with high RTS penetration and has the highest penetration of RTS compared to its total installed solar capacity (81 per cent).

Challenges for the DISCOMs

The rapid growth in RTS capacity, particularly via net metering, has created a problem for the Kerala State Electricity Board (KSEB):

- **Financial loss:** The KSEB has been forced to procure expensive power from

power exchanges during periods of high demand to manage excess banked solar power, causing a net loss of an estimated Rs 500 crore in FY 2024-25 in power procurement for meeting evening peaks.

- **Systemic challenge:** The original net metering regime provided maximum net savings to consumers, which meant the utility bore the increasing costs for balancing, banking and wheeling the excess power.

Policy response: The Draft Renewable Energy and Related Matters Regulation, 2025

The Kerala State Electricity Regulatory Commission (KSERC) released a draft regulation on RE and related matters in 2025 to reform and facilitate RE integration, particularly for the RTS segment see *Table 1: Changes proposed by the draft regulation*).

Table 1: Changes proposed by the draft regulation

Provision	What changed from the older regulation	Impacts/consequences
Net metering limit	Drastically reduced from 1,000 kW (1 MW) to 3 kW (up to 5 kW with a minimum of 30 per cent storage)	Excludes large commercial and industrial (C&I) customers and other large load consumers, restricting the maximum savings to domestic users only.
Tariffs and billing	Introduced time-variable (time-of-day) tariffs for all new and existing net-metered consumers	Shifts from a simple one-to-one offset of tariffs to a system based on a normalisation factor, reducing the compensation/savings on exported energy. This will impact existing consumers, especially those who have higher installed capacities.
New charges	Introduced a grid support charge of Re 1/unit on exported energy for systems above 10 kW	Significantly reduces the net export tariff for C&I consumers and those with higher loads, further discouraging solar injection. Since RTS users now face reduction in export tariff along with time-variable inclusion, their options have become limited to shifting to on-site battery storage. The market for on-site storage is still nascent and may turn Kerala into a test-bed for RTS storage modalities.
Revision in tariff rates	Introduction of weighted average of SECI-determined tariffs for RTS users which are significantly lower (almost 40 per cent) than current APPC rates	The savings anticipated annually by users and their business models will be impacted heavily. Also, since SECI tariffs are for large-scale procurement, their application and relevance for small rooftop solar system owners warrants further discussion.

Source: Author analysis

Will the new draft regulation be suitable for different categories of users?

The new regulations are unlikely to work effectively in their current form, as they introduce market-dampening and restrictive measures such as:

- **Financial disincentives:** The changes significantly reduce the financial savings for customers, especially those with higher loads (like C&I), who are now facing substantial additional costs (for example, a 20-kW consumer could have to pay an estimated Rs 3,277 per month).
- **Mandate for storage:** The regulations heavily incentivise consumers to adopt expensive, unsubsidised on-site battery storage (Rs 16,000-18,000/kWh) to maintain their benefits, which increases their initial CAPEX and may be financially unviable for many.
- **Policy mistrust:** The move has rattled the domestic consumer base and could have a significant negative impact on RTS growth, as it penalises existing consumers who invested based on previous policy certainty.
- **Alternate means of metering** such as net billing and gross metering have been introduced for the first time and are tentatively offering higher export tariffs for new users. Since the calculation varies under each metering mechanism, any deviation from net metering will offer reduced savings to consumers.

WHAT THE REST OF THE WORLD IS DOING

The global experience with high rooftop solar penetration offers several effective solutions to reduce the financial and technical burden on distribution companies (DISCOMs); these solutions also work towards incentivising consumers towards opting for self-generation and consumption of electricity.

- Alternative compensation models: These factor in high feed-in tariffs (FiTs) and time-use pricing in order to incentivise users to shift to RTS and avoid high retail electricity costs; they also focus on time-energy utilisation based on prevailing tariffs and energy supply position. The FiTs can be structured for users based on their potential for self-consumption and surplus compensation.
- Utility-scale storage and demand management: These include battery-based long-duration storage systems (BESS) which offer services to reduce congestion and to provide peak management, while also storing surplus generation during the day. The BESS systems offer flexibilities to factor in surplus or deficit power supply positions. Other demand side management responses include aggregation from numerous decentralised rooftop systems for optimum energy utilisation and scheduling.
- Alternative ownership models: These include virtual and group net-metering and also offer advantages in business models which provide for sufficient customisation and flexibility for rooftop owners without dedicated on-site spaces. Advancement of ownership models via RESCO/OPEX-based systems clubbed with advanced metering infrastructure allows various categories of users, especially in commercial and group-housing entities, to shift to RTS.

Learnings and the way ahead

Kerala's RTS programme requires a course correction:

- **Dialogue and clarity:** The KSERC needs further deliberations and dialogue with stakeholders to clarify the new metering and billing provisions and remove mistrust.
- **System-level storage:** Instead of solely burdening consumers, the state (KSEB) is better positioned to internalise the storage costs and adopt Battery Energy Storage Systems (BESS) at the distribution or transmission level. Utility-led BESS, which is becoming competitive (Rs 3.30-4.7/kWh), can manage intermittent RE and provide grid arbitrage services.
- **Progressive architecture:** To ensure the symmetric development of RE, the regulatory architecture should be enabling and market-guiding with business models (such as Virtual Net-Metering, VPPA) rather than restrictive.

2. ROOFTOP SOLAR IN KERALA

Scope and existing business models

Kerala, which has a total power demand of 4,400 MW, has an installed production capacity of 7,648 MW; of this, thermal sources stand at 3,109 MW and RE sources are at 4,177 MW within the state. The balance is procured from outside the state. Kerala's total share of RE—54.6 per cent of the installed capacity—is one of the highest in the country.[1]

The state has been one of the earliest adopters of solar energy, starting with regulations on power procurement from solar PV plants in 2008. It has mainstreamed rooftop solar (RTS) from 2014 onwards by establishing regulations on grid-interactive RTS systems.

Currently, Kerala leads among the top five states in India that have a high penetration of RTS-based on-site energy generation (*see Table 2: Installed RTS capacity in the top five states*). The other states with high RTS penetration are Gujarat, Maharashtra, Rajasthan and Tamil Nadu. As of August 2025, Kerala's installed capacity of RTS is 1.51 GW. This is 81 per cent of the total installed capacity of solar in the state.

Alongside, the state has also been progressive in terms of increasing its share of Renewable Purchase Obligations (RPO). At 50 per cent of RE-based power procurement, this is now higher than the national target. Kerala also boasts a relatively higher share of RE integration in the energy mix: more than 20 per cent.[2]

As per estimates, the potential for renewable energy in the state is 14 GW, which includes 10 GW of solar power[3]. The solar capacity comes very close to current installed hydroelectric capacity (2,090 MW) and is expected to soon surpass it. As per the Kerala State Electricity Board (KSEB), day-time generation from solar has already crossed hydel energy generation. The Kerala Energy Transition Roadmap says the overall energy consumption in the state is growing at a CAGR of three per cent.

Table 2: Installed RTS capacity in the top five states

State	Current installed solar capacity (MW)	Current installed RTS capacity (MW)	Percentage of total solar installed capacity as RTS (%)
Gujarat	22,806	5,898	25.8
Maharashtra	15,005	4,086	27.2
Rajasthan	33,163	1,773	5.3
Kerala	1,862	1,514	81.3
Tamil Nadu	10,983	1,163	10.5
Karnataka	10,083	763	7.5

Source: CSE's calculation based on MNRE Physical Progress

The Soura programme

This is the flagship programme of the KSEB, and has been a major catalyst in propelling the state towards fulfilling its RE aspirations. The 'Soura Programme' was launched in 2019-20 as a major initiative to promote rooftop solar installations and help the state achieve its renewable energy goals. It was designed to add 1,000 MW of solar power, with 500 MW from rooftops.

The programme has operated through different business models to attract consumers:

- **Model 1 (RESCO):** The KSEB installs and maintains the plant at its own cost on a consumer's rooftop for 25 years. In return, the consumer gets 10 per cent of the generated power for free.
- **Model 2 (fixed tariff):** The KSEB sets up the solar installation and supplies to the consumer at a fixed tariff for 25 years. This fixed tariff is lower than the retail electricity tariffs and benefits consumers who have a large day-time load consumption, such as educational institutions, offices and government institutions.
- **Model 3 (CAPEX):** Consumers bear the cost of installation and own the plant. The KSEB helps with the installation and grid connection. Excess energy can be sold to the grid at a rate set by the Kerala State Electricity Regulatory Commission (KSERC).

A crucial feature of the Soura programme is the implementation of net metering. This allows consumers to export any excess electricity they generate back to the KSEB grid. This helps reduce their electricity bills and, in some cases, even earn credits for the surplus energy.

3. THE NEW DRAFT REGULATION

Renewable Energy and Related Matters, 2025 – its provisions

Recently, the KSERC has released a draft regulation titled Renewable Energy and Related Matters, 2025 to facilitate renewable energy development in the state. The draft guides the manner of application for several aspects:

- Determination of energy tariff from RE systems, including BESS and pumped storage plants
- RE metering and billing arrangements applicable for new customers along with introducing net-billing and gross-metering mechanisms
- Technical feasibility of RE-based power generation in matters of connectivity, grid support charges, energy accounting and application of tariff charges for consumers
- Renewable Purchase Obligations and their compliance, including facilitating Resource Adequacy Plans for KSEB (and other applicable licensees) to plan actions commensurate with energy transition goals

The draft regulation primarily seeks to reform and facilitate RE integration in the state, especially for the rooftop solar segment, by introducing new metering and billing mechanisms; new features under net metering and changes under banking and tariff applicability; and a progressive metering infrastructure. It has also recommended compliance targets and mechanisms for Renewable Purchase Obligations in the state towards reaching 50 per cent of RE-based power by 2030.

The regulations mention that old consumers under net meter shall continue to operate in the previous manner; however, time-variable tariffs and grid support charges will be applicable on them. The benefit which was earlier available to net-metered consumers cannot be availed under the draft regulations (For comparison with the old regulations *see Table 3: A comparative analysis of the old regulation and the new draft regulation*).

Table 3: A comparative analysis of the old regulation and the new draft regulation

Regulatory provision	New draft regulation (2025)	Old regulation	Impacts/consequences
Net metering	Minimum capacity is 1 kW; maximum is 3 kW with an additional provision for 5 kW subject to minimum 30 per cent storage capacity	Minimum capacity is 1 kW; maximum capacity is 1,000 kW (1 MW)	Steep reduction in the limits for net metering to under 3 kW. This would exclude customers with higher demand loads from availing net metering, as a size restriction technically disqualifies all large C&I customers as well as those with significant day-time consumption who will get reduced benefits.
Net billing	Minimum capacity is 1 kW; maximum capacity is 500 kW	Introduced in the 2025 draft	Since the limit for net metering is 5 kW, any consumer using up above that amount can now only avail the net billing mechanism with reduced monthly electricity savings (as compared to the net metering provision allowed earlier). A rationale needs to be provided in clubbing consumers with 10-25 kW loads with those that have loads of over 100 kW.
Gross metering	Minimum capacity is 1 kW; maximum capacity allowed is 3 MW	Introduced in a new form in the 2025 draft: previously, the regulation mentioned the mechanism of gross metering as a provision besides net metering and allowed consumers to choose between the two	Consumers who use up more than 500 kW can now avail gross metering. This has been changed from the 1 MW allowed previously under net metering. Also, since the net billing limit is also 500 kW, consumers who use up over that amount may have lower monthly savings compared with the net billing model.
Tariffs	Net meter: Rs 2.09/kWh Net billing: Rs 2.79/kWh Gross meter: Rs 3.48/kWh	Current: Rs 3.15/kWh With accelerated depreciation: Rs 3.6/kWh approximately	Existing net-metered connections with higher loads tend to lose the most. For new customers with higher loads, shifting to gross meter or net billing is the only option.
Time-variable tariff pricing	Solar prosumers are subjected to time-variable tariffs in determinants to three time zones of consumption (solar hours, peak hours and non-peak hours). The tariff for export and import of power will be fixed according to a normalisation factor mentioned in the draft regulation	No provisions for time-variable tariffs for net-metered consumers below 20 kW; gross-metered consumers were subjected to time-variable tariffs	Time-variable tariff applicable for all consumers under net metering arrangement. Further, the energy generated in one particular time zone can be offset only during the corresponding time zone; there is a normalisation factor added for deciding tariffs for export/import during different time zones. For consumers under gross metering and net billing, applicability of time-variable charges levied shall be determined later. This means that unlike earlier when energy generated during one time-zone can be utilised at the same tariff shall now be subject to variable tariffs – meaning, excess solar generated during the day and banked for consumption during non-solar hours shall be subjected to lower tariffs during calculation of monthly billings.

Source: Author analysis

A critique of the draft regulation

The major changes proposed in the regulation which will impact the RTS sector, along with possible inferences from their implementation, are as follows.

Net metering (NM)

- **Provision 1:** Under the draft regulation, consumers shall be allowed to license net metering for capacities under 3 kW; this will also be applicable for up to 5 kW for consumers installing hybrid inverters with storage capacities of at least 30 per cent of the load (behind-the-meter storage). The draft also provides for group net metering for eligible consumers subject to the 3-kW limit (maximum 5 kW with storage) for each of the consumers, with the total capacity of the group net-metered RE plant to not exceed the cumulative capacity of all premises taken together.[4]

- **Inference:** There is a drastic reduction in the size of net metering from 1,000 kW (1 MW) to 3 kW. The 3-kW norm practically restricts net meter installations to domestic consumers only, since as per the KSEB, 99.1 per cent of consumers fall in this category.

Since net savings on electricity bills are maximum in net metering, consumers may not get the same benefits as before under the new draft regulation. **This shall especially impact consumers with significant day-time consumption such as educational institutions, offices etc, which were earlier benefitting directly.**

- **Provision 2:** The energy generated by the REGS (renewable energy generating station) shall be first offset against the simultaneous energy consumption of the prosumer; the surplus, if any, can be exported, banked for use in other time periods and billed in a time-zone wise approach where energy exported shall be first adjusted against energy imported in the same time zone. If the entire exported energy is completely adjusted, the balance imported energy shall be billed as per applicable retail supply tariffs. The exported energy in each time zone remaining after settlement shall be billed as per a normalisation factor for the three time zones (*see Table 4: Normalisation factors for withdrawal and injection of banked energy under net meter RTS*).

As per the draft, the energy generated shall be first offset against simultaneous energy consumption in three zone-wise time-periods. The energy exported in each time-zone shall be first adjusted against import in the same time-zone. The balance shall be adjusted as per the normalisation factor (time-variable tariffs) (see Table 4: *Normalisation factors for withdrawal and injection of banked energy under net meter RTS*).

Columns 'A' and 'B' in the Table mention the normalisation factor for export and import of tariffs. Column 'A' shows that the tariff for excess generated electricity exported during solar hours shall be normalised with a factor of 1 – this means the same rate as feed-in tariff (FiT) is applicable if exported during solar hours. For export during peak non-solar hours, a factor of 1.5 applies (which means at 1.5 times the FiT); and for off-peak non-solar hours, a factor of 1.15 is applicable. To put it simply, the RTS owner shall be compensated for excess generation at 1, 1.5 and 1.15 times the FiT rates. In an ideal scenario, solar rooftops are grid-connected without on-site battery storage. The new notification thus is asking consumers to opt for storage on premises if they wish to benefit higher FiTs in order to reduce electricity bills. This also means extra financial load on consumers in terms of buying batteries.

Column 'B' mentions the normalisation factor for importing tariffs based on banked energy. A consumer with excess solar units, when importing during solar hours, shall be billed with a factor of 1; imports during peak non-solar hours will be billed with a factor of 0.667, while for off-peak non-solar hours, the billing factor will be 0.85.

Table 4: Normalisation factors for withdrawal and injection of banked energy under net meter RTS

Time zone		Normalisation factor to arrive at the banked quantum of energy	Normalisation factor for taking back banked quantum of energy offsetting
		A	B
Solar hours		1.0	1.0
Non-solar hours	Peak hours	1.5	0.667
	Off-peak hours	1.15	0.85

Source: KSERC draft regulation on RE and related matters, 2025

Inference: Application of time-variable (time-of-day) tariffs means tariffs are applicable for withdrawal during different periods of the day based on the cost of supply during that particular period. The draft mentions adopting a time-zone tariff approach based on three different time zones — solar, peak and non-

peak hours — with each having a different pricing for injection and withdrawal; compared to this, the earlier regulation did not prescribe any variable tariffs.

This essentially means that instead of one-to-one offset of tariffs, the normalisation factor will be decisive. For an installation above 3 kW, if the earlier solar hour export tariff amounts to Rs 3.5/kWh, it will become Rs 2.33/kWh during peak hours and Rs 2.9/kW during non-peak hours. Earlier, time-variable tariffs were applicable only for consumers with over 20-kW loads. Now, time-variable tariffs are applicable for all new and existing consumers.

Provision 3: The draft introduces grid support charges to be levied on exported energy under net metering systems at the rate of Re 1/unit. These charges shall be further determined based on the consumer tariff category on the proposal of distribution licensee in its tariff petition.

Inference: There is an addition of 'other charges' under the new net metering regime. These other charges include 'grid support charges' on exported energy which shall account for balancing, banking and wheeling costs, meter rent etc; these will be applicable for consumers using over 10 kW only with a tariff of Re 1/ per unit. This means that these consumers will have to bear the additional costs in the excess units that are generated.

These costs are over and above the time-variable tariffs—consumers, therefore, are losing out as besides the time-variable tariffs, they are also bearing an additional Re 1/unit cost for injecting solar. This significantly reduces the savings for C&I consumers (or those with higher loads), unless they install expensive on-site storage mechanisms.

Another provision is the introduction of export tariffs that are significantly lower than the current rates of Rs 3.15-3.5/kWh (Average Power Purchase Cost rates) – these new tariffs will be based on tariffs determined by SECI (and related REIA tenders) and will be under Rs 2.3/kWh approximately. Further, there is application of certain other charges such as meter rents, grid support charge, electricity duty and wheeling etc which will further reduce the overall electricity savings.

Table 5 explains how the draft regulation is going to affect existing and new customers who opt for net metering. Earlier, the benefit was available to consumers who had RTS up to 1 MW capacity; now, consumers with less than 2 kW of solar rooftop will get the same benefits.

Table 5: Provisions impacting RTS under net metering in the draft regulation

Export tariff under net metering with inclusion of time-zone tariffs	Solar hours export tariffs (Rs/kWh)	Peak hours (non-solar) export tariff (Rs/kWh) with normalisation factor	Non-peak hours (non-solar) export tariff (Rs/kWh) with normalisation factor
Old regulation (Tariff for import and export is the same)	(1:1 offset, simultaneous generation and consumption, excess goes to banking)	(1:1 offset was available, excess generation is offset with grid import tariffs)	(1:1 offset, excess generation is offset with grid import tariffs)
Draft regulation: up to 2 kW	Time-zone wise normalisation factor is 1 for all time zones for systems under 2 kW		
Draft regulation (export tariff applicable only over 3 kW-10 kW)#	3.5	2.33 (normalised tariff for import during solar hours from excess banking)	2.9 (normalied tariff for import during solar hours from excess banking)
Import tariff (retail)	7-8.5	7-8.5	7
Draft regulation (export tariff applicable over 10 kW+)	3.5#	2.33	2.9
Grid support charges added to export tariff for 10 kW and above	1	1	1
Net export tariff (10 kW and above)	2.5	1.33	1.9
Net import tariff (retail supply)^	7-8.50	7-8.50	7-8.50

Source: Author analysis

 # With export tariff (approximately) as Rs 3.5/kWh; actuals may vary
^Taking approximation here based on average of current retail supply tariffs for under 200 units and 500 units. Tariff for under 3 kW is approximately Rs 7/kWh; for 3-10 kW, it is Rs 8.50/kWh.

Under the net metering provisions in the draft regulation, consumers who use 3 kW or more will bear an additional expense of Rs 330 per month; likewise, those using 5 kW or more will bear an additional cost of Rs 651 per month (*see Table 6: Tentative additional costs borne by domestic consumers under the new draft regulations with net meter RTS*). While the increases in additional expenditures are not very substantial for smaller capacity systems, they will be high for bigger

capacities under C&I segments. For example, a user with 10-kW net meter shall bear additional charges of approximately Rs 1,629 per month, while a 20-kW consumer may have to pay an additional 3,277 per month (*see Table 7: Tentative additional costs borne by C&I consumers under new draft regulations with net meter RTS*).

These higher charges are mainly due to addition of Re 1/unit 'grid support charge' levied on consumers with an over 10 kW capacity. This will reduce the net export tariff to almost less than Rs 1.3/kWh from earlier retail supply rates, and increase overall expenditures on electricity consumption.

Table 6: Tentative additional costs borne by domestic consumers under the new draft regulations with net meter RTS

Comparison of charges under draft regulation for net-metered RTS (*Assuming 1/3rd consumption during each time zone)		**Domestic under 200 units with 2 kW solar (Rs/kWh)**	**Domestic under 300 units with 3 kW solar (Rs/kWh)**	**Domestic under 500 units with 5 kW solar (Rs/kWh)**
A	Average import tariff (retail supply) Rs/kWh	6	6.75	7.9
B	Tariff equivalent under net meter for solar hours	6	6.75	7.9
C = B x 0.66	Tariff for export during peak hours	6	4.55	5.2
D = B x 0.85	Tariff for export during non-peak hours	6	5.73	6.7
E = Units consumed in solar hours x B (1:1 offset available)	Charges during solar hours	0 No time-variable tariffs apply; therefore, the entire consumption is offset with solar generation	0 (simultaneous generation and consumption)	0 (simultaneous generation and consumption)
F = (units consumed x A-banked units x C)	Charges during peak hours		229.5	450.9
G = units consumed x A-banked units x D)	Charges during non-peak hours		101.3	200.4
H = F+G (assuming E is entirely offset in solar hours)	Net charges payable after deduction of solar units generated based on ToD factors	0	Rs 330.8/ monthly	Rs 651.3/ monthly
	Charge under net-metered solar under previous regulation	0	0	0

Note: Alphabet numbers A through H detail the formulae and rational examples and have been used for internal referencing only

Source: Author analysis

Table 7: Tentative additional costs borne by C&I consumers under new draft regulations with net meter RTS

Comparison of charges under draft regulation for net-metered RTS		C&I consumer under 10,000 units with 10 kW solar (Rs/kWh)	C&I consumer under 12,000 units with 10 kW solar (Rs/kWh)	C&I consumer under 20,000 units and 20 kW solar (Rs/kWh)
A	Average import tariff (retail supply) Rs/kWh	5.9	5.9	5.95
B	Tariff equivalent under net meter for solar hours	5.9	5.9	5.95
C = B x 0.66	Tariff for export during peak hours	3.89	3.89	3.93
D = B x 0.85	Tariff for export during non-peak hours	5.02	5.02	5.06
E = units consumed in solar hours x B	Charges during solar hours	19667	23600	39666
F = units consumed in peak hours x C	Charges during peak hours	6686	8024	13487
G = units consumed in non-peak hours x C	Charges during non-peak hours	2950	3540	5950
H = F+G (assuming E is entirely offset in solar hours)	Grid support charges Re 1/kWh on total solar energy exported.	6667	8000	13333
	Net charges payable after deduction of solar units generated based on ToD factors	**Rs 16,302/month**	**Rs 19,564/month**	**Rs 32,770/month**

Note: Alphabet numbers A through H detail the formulae and rational examples and have been used for internal referencing only.

Source: Author analysis

Emerging scenarios and impacts on RTS after implementation of draft regulations

The biggest changes that the new draft regulations would bring in are related to the introduction of time-variable tariffs for all consumers—new and old. The normalisation factor that has been introduced has been incentivised to help move consumers towards maximising consumption during solar hours, which is a good measure. However, the tariffs after normalisation are expected to be low, which

means consumers will not be getting the anticipated benefits from their solar installations. This is because:

- firstly, they are subjected to lower solar export tariffs for excess generation;
- secondly, applicability of ToD tariffs will further reduce the difference between net-import and net-export tariffs – as a high difference between import and export tariffs entails higher savings, use of ToD would reduce this difference.

The introduction of 'grid support charges' for higher capacity systems is another sticking point. This will affect installations with higher loads – the provision groups all users with capacities above 10 kW as a single entity, when in reality the load profiles and consumption patterns can vary. For example, an educational institution's load profile matching the solar hours can be very different from that of a hospital operating round-the-clock. Earlier, both these types of consumers could benefit from excess units banked on days that had low generation; the new draft regulation dents this advantage.

The new draft aims to shift consumers towards opting for on-site storage in order to continue receiving benefits as before. A consumer (irrespective of load size or type— residential, commercial or industrial) will have to bear additional on-premises storage costs of Rs 16,000-18,000/kWh. This is besides the cost of the rooftop solar system. Currently, behind-the-meter (BtM) storage systems are not covered under any subsidy or a CFA (central financial assistance) programme.

Consumers with higher load capacities can now opt to shift towards net billing or gross metering mechanisms to stay competitive and keep their overall costs of doing business in check. Since storage costs will have to be internalised by consumers, it would raise the initial CAPEX costs and bring down the marginal benefits from electricity savings which can come from adopting RTS. All solar consumers are price-sensitive and would be reluctant to establish on-site storages. In India, the market for behind-the-meter storage is still at a nascent stage and has not been established as a secure business model.

4. Stakeholder Discussions

A set of agendas

Obviously, further deliberations are required on this draft regulation. The KSERC should initiate a dialogue with stakeholders on metering arrangements and their billing provisions in order to avoid any misgivings about the draft.

AGENDA 1: Initiate discussions on metering arrangements and their billing provisions aligning with RTS development

The critical provisions of the regulation that are expected to have big impact are the sizing restrictions for net metering and introduction of time-zone tariffs for new and old consumers. Also, clarity is required in the implementation processes for net billing and gross metering arrangements as applicable for different categories of customers.

The KSERC says that one of the key reasons for bringing in the draft regulation was the need for managing excess stored solar power during periods of high demand. The KSEB has been procuring expensive power from power exchanges, which has saddled it with a net loss of Rs 500 crore in FY 2024-25. RTS deployment, therefore, holds promise as an alternative.

Currently, the total number of RTS installations (consumers) in Kerala is estimated at 0.18 million (1.8 lakh), against a total consumer base of approximately 10.5 million (1.05 crore). The main base of RTS growth in the state are domestic consumers, who are rattled by the billing mechanism introduced in the draft regulation. This can have a significant impact on the growth of RTS in the state.

AGENDA 2: Explore alternate existing market mechanisms to integrate storage

The draft regulation tries to put the onus of battery storage on consumers. However, there are studies which highlight the role of storage (especially batteries) in arbitrage services which can benefit utilities in managing intermittent power from RE sources. Also, given the overall quantum of power procurement needed from RE sources to displace thermal sources as per net zero trajectories, it is critical to include storage modalities in the distribution and transmission networks.

Recent tenders awarded by various utilities in India—Haryana, Gujarat, Maharashtra and Tamil Nadu—have opted for BESS based on time-of-use optimisation principles: the draft regulation has touched upon this, but largely at the level of the consumer.

Here, the KSEB is better placed towards adopting and rationalising storage than completely shifting on its consumers by signaling higher tariffs and banking guidelines. Currently, prices for BESS tender are continuously declining with discovered tariffs ranging between Rs 3.30-4.7/kWh – these are competitive with thermal power tariffs. Opting for storage under revenue-generating models where excess power procured during the day is sold on the power exchanges essentially recovers the capital costs incurred in buying the storage systems.

AGENDA 3: Ensure transparency by KSERC to remove mistrust and provide a progressive regulatory architecture in the state to promote RE

Existing research on RTS performance in India indicates that a positive and stable regulatory regime can ensure symmetrical development of RTS and RE. The draft regulation's objective is to progress towards a higher share of RE in the total energy bouquet of Kerala. The state has already exhibited a robust growth in RTS; nearly 75 per cent of this growth has happened in the last five years. Enabling regulations— rather than restrictive laws which end up dampening the markets— are needed now to guide the markets with appropriate business models on RE development.

While the 'intent' in the draft regulation hints at managing RTS installations in the states, it fails to take cognisance of existing consumers who may have opted for net-metering based on previous regulatory certainty in terms of RTS policies. Also, the inclusion of parameters such as virtual net-metering, virtual power purchase agreements (VPPA), vehicle to grid (V2G), and rooftop solar and storage RPO targets signal a movement towards higher RE capacities and market development in the state.

While earnest in intent, due diligence towards working out the marginal costs of power procurement and of retail tariffs is an imperative; otherwise, it will trigger uneasiness in the rooftop solar and wider RE segments. Clearly, the intent has been towards supporting business models which can drive the RTS markets; however, the primary redressal remains for tariff corrections, since the most direct impact stems from them.

THE GLOBAL EXPERIENCE ON METERING SYSTEMS AND MANAGEMENT IN RTS

The resilient nature of rooftop solar-based energy generation systems has gained popularity in other nations as well. The rationale for deployment has been both—offsetting current grid-based consumption, and reducing energy deficit from lack of suitable electricity infrastructure.

The success of RTS installations relies heavily on the metering systems. Table 8 explains the existing mechanisms in a few countries that have a high RTS penetration. The trends show that dedicated RTS policies alongside facilitative mechanisms such as feed-in tariffs, energy banking, generation-based incentives etc can incentivise deployment.

Alternative compensation models: These factor in attractive feed-in tariff (FiT) rates which can incentivise users in two ways—high FiTs encourage more users to shift to rooftop solar/own generation systems and avoid high retail electricity tariffs, and time-use pricing based on minimal deviations from conventional export tariffs shifts users towards energy use during non-peak and solar hours. Both can help users gain maximum benefits from self-energy generation. With the use of digitisation within these models, users can be incentivised for system flexibilities, and provision can be made for compensation models mirroring user patterns based on diurnal and seasonal changes.

Utility-scale storage and demand management: Instead of making battery storage mandatory for consumers, the DISCOM can adopt utility-side solutions. These can be structurally configured within the business models involving RTS as follows;

- **Utility-scale Battery Energy Storage Systems (BESS):** A DISCOM can invest in utility-scale BESS at the substation level or on the transmission network. This allows the utility to charge the batteries with cheap, surplus solar power during the day and discharge them during the evening peak demand, thereby reducing reliance on expensive spot-market power procurement (known as energy arbitrage). BESS prices are falling, making this a rapidly growing global practice.
- **Demand response (DR) programmes:** DR programmes incentivise large consumers (like C&I segments) to temporarily reduce or shift their energy consumption during peak periods in exchange for compensation. This is a cost-effective way to manage sudden high demand and avoid grid strain without resorting to emergency power purchases.
- **Virtual Power Plants (VPPs):** VPPs aggregate and remotely control a large number of small distributed energy resources (like rooftop solar systems, batteries and smart appliances) to operate as a single, controllable power plant. The world's largest VPP project in Australia comprises tens of thousands of solar and battery systems. This gives the grid operator better visibility and control over resources.

Alternative ownership models

- **Virtual Net Metering (VNM):** This allows tenants in multi-family buildings or people without suitable roof space to subscribe to a centrally located solar array (for example, on a community or government building) and receive billing credits. This expands solar access without overburdening the local low-voltage grid.
- **RESCO model:** The utility (or a third party) owns and operates the solar power system on the consumer's roof, and the consumer pays for the power at a pre-determined lower tariff. This reduces the consumer's upfront cost and ensures the system is installed to meet high-quality standards. Further, they can also explore additional mechanisms such

as peer-to-peer energy trading standards. However, realistically and in the Indian context, provisioning of solar export tariffs which minimally deviate from assured FiTs alongside ownership models can significantly expand the share of RTS in the markets.

Table 8: Comparison of enabling RTS policies in various countries

Country	Policies which influenced higher penetration of RTS systems
Germany	Attractive feed-in tariffs for RTS users, easing of permits for connectivity, introducing solar community-based installations (clusters) and advancements in grid infrastructure and smart meters.
Japan	High share of distributed solar energy from high feed-in tariffs for residential consumers. Dedicated solar programmes for various consumer segments. Development of business models within RTS for electric vehicle charging, building design codes, corporate PPAs etc.
USA	One of the highest CAGR growths in RTS in the world led by state-specific deployment such as in California, Texas and Arizona with policies on tax credits, net metering and community-based solarisation programmes which have incentivised self-consumption.
Italy	Attractive feed-in tariffs which have created one of the largest markets for RTS, including tax incentive bonuses for self-consumption.
Saudi Arabia	Long-term PPAs with fixed and attractive feed-in tariffs for electricity production, easy financing for RTS projects and mandates towards using RTS for new home users.

NOTES

Metering arrangements permissible under RTS

Net metering: The rooftop solar model is based on a grid-connected solar photovoltaic (PV) installation with DC modules. These systems are integrated with a dual-functioning electricity meter, present at the consumer's premises. This is called a net meter, which accounts for withdrawal and injection of power for consumption, based on applicable charges. A consumer primarily uses solar power during the day, selling the excess to the DISCOM, and consuming from the grid during non-solar hours. The net meter accounts for the net consumption over a defined period cycle, which may be monthly, quarterly or annual. Typically, the applicable tariff rates are assumed to be same for injection and withdrawal of power from the grid, thereby offering the most savings to consumers while also availing of rollover of surplus energy generation.

Gross metering: Under this metering arrangement, the total power generated from the RTS installation is first fed in the grid during solar hours at feed-in tariff rates (or APPC) decided by the DISCOM with reference of state electricity

commissions. The consumer continues to use power from the DISCOM for applications charged at conventional retail tariff rates. Later, at the end of the month/cycle, the total energy consumed is offset against total gross generation from the RTS system. The consumer does not see maximum benefit since the feed-in tariff rates are often quite cheaper (Rs 2-4 lower than retail tariff rates) as compared to retail tariffs consumed during the billing month/cycle.

Net billing: This mechanism is similar to the net-metering arrangement with the exception that the power exported during solar hours is billed at a slightly higher tariff than APPC costs, for simplicity known as net-billing tariff. At the end of the billing month/cycle the energy accounting occurs to settle the bill based on net-import/export of power. This metering arrangement offers a middle ground for consumers and DISCOMS: the total savings are higher than gross metering but not as high as net metering and also allows utilities to bill exported power units appropriately and without financial losses.

REFERENCES

1 Anon 2025. Physical Achievements: Programme/Scheme wise Cumulative Physical Progress, Ministry of New and Renewable Energy, 2025. Available at https://mnre.gov.in/en/physical-progress/, as accessed on 16th September 2025.

2 Binayak Mishra, Hanumanth Raju GV, Mallik EV, and Rishu Garg 2024, *Kerala Energy Transition Roadmap 2040*. Center for Study of Science, Technology and Policy Available at https://keralaenergy.gov.in/wp-content/uploads/2023/12/CSTEP_KL_Roadmap_2040_01Feb24-1-4.pdf, as accessed 18th September 2025.

3 Ibid

4 Anon 2025. Renewable Energy and related matters regulation (draft). Kerala State Electricity Regulatory Commission (KSERC). Available at https://dev.erckerala.org/api/storage/draft-regulations/S14zi66oka1sWxBmd0yGYIirty-jZRvwRqlWDChal.pdf, as accessed on 8th September 2025.

Centre for Science and Environment
41, Tughlakabad Institutional Area, New Delhi 110 062
Phone: 91-11-40616000 Fax: 91-11-29955879
E-mail: cse@cseindia.org Website: www.cseindia.org