

Consumer guide to grid-connected rooftop solar - Part 6

The [previous issue](#) explained about cost mentioned in the quotation for the installation and maintenance of rooftop solar. This part will explain payment terms and conditions in the quotation for the installation and connecting the rooftop solar with the utility grid.

Payment terms and conditions

- Generally, developers demand an advance payment - between 30% and 50% of the total amount. Payment mode will have to be ascertained (i.e., cash, cheque, online).
- Consumers will receive an acknowledgement for the payment done.

Material dispatch and installation

- Check for the time period for dispatch of materials.
- The time period for dispatch is based on the availability of the materials. Certain developers have stock readily available and may deliver in a short span of time. While others may have to get the stock from outside resulting in longer delivery time.
- Check the time period required for installation.

Assessing the technical feasibility for connecting with TANGEDCO distribution network

A consumer interested in installing a rooftop solar PV system should enquire with TANGEDCO for connecting rooftop solar PV with the utility's distribution network or grid. TANGEDCO officials in consumer's area will ascertain the technical feasibility of connecting the rooftop solar with the utility grid. TANGEDCO officials will ensure that the a) Installed capacity does not exceed 100% of the sanctioned load as per [Order on Rooftop Solar Generation](#), b) Total solar PV system connected to distribution transformer does not exceed 90% of the distribution transformer capacity. Consumers can avail further guidance from the installers.

How does the rooftop solar, connected to the distribution network or grid of the utilities, work?

Rooftop solar generates DC power and a solar grid inverter will convert the DC power to an AC power. For its functioning, the solar grid inverter synchronises its AC output frequency with the grid frequency (nominally 50Hz) and adjusts its AC voltage output to be slightly higher than the grid voltage so that surplus energy, if any, flows to the grid. The customer is a net exporter of power to the grid when there is surplus generation than consumption and is a net importer of power from the grid when solar generation is less than consumption. Both grid frequency and voltage are needed for the solar grid inverter to function correctly.

If the rooftop solar is not connected to the distribution network or grid of the utilities, will it still function?

Yes. This is an off-grid system where the inverter creates AC power (voltage, frequency, wave form). The battery is a storage device in which DC power is stored. In this case, the battery does not provide frequency and provides only DC voltage, not AC voltage. To elaborate, a stand-alone inverter creates "fresh" AC power (voltage, frequency, wave form) from DC. A solar grid inverter adds energy to an already existing AC power waveform. Some stand-alone inverters create pure sine waves, others create block waves or approximate sine waves.

(to be continued...)

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Electric Vehicles (Part - 4)

Part - 4 of the Electric Vehicles series will explain the most common battery technologies used for electric vehicles as a continuation of [previous issue](#).

ii) Lead-acid batteries

A lead-acid battery consists of a metallic lead negative electrode, a lead-dioxide positive electrode, and electrolyte solution sulphuric acid. Charging and discharging of battery takes place through the reaction of anode and cathode with the electrolyte. These are the [first rechargeable batteries](#) commercially used in electronic devices. Major advantages of lead-acid batteries of EVs are that they are inexpensive, reliable, [perform well at low and high temperature](#) and [can be recycled](#). More importantly lead-acid batteries are swappable. [98% of the e-rickshaws](#) in tier 2 & 3 Indian cities are being run using lead-acid batteries. Also, '[advanced high-power lead-acid batteries](#) are being developed and these batteries are only used in commercially available electric-drive vehicles for ancillary loads'.

Lead-acid batteries [release gases](#) that are harmful to health and environment making them the least preferred battery for new EV designs. Increasing improvements in other battery technologies are also reducing the usage of lead-acid batteries in EVs.

iii) Nickel-metal hydride batteries

A Nickel-metal hydride battery consists of a positive nickel electrode and a negative hydride electrode in potassium hydroxide electrolyte. These batteries are [mostly used in hybrid EVs](#). They have a longer life cycle than the lead-acid batteries and require less storage space because of their high specific energy. The major drawbacks are high cost, heat generation at high temperature, more self-discharge, and hydrogen loss. A comparison of different technologies of batteries is given in Table- 1.

Table - 1: Comparison of different technologies of batteries for EVs

Battery technology	Lifespan (in cycle)	Nominal voltage (in V)	Specific energy (in Wh/kg)	Specific power (in W/kg)	Charging efficiency (in %)	Self-discharge rate (in % / month)	Operating temperature		Safety
							Charging temperature (in °C)	Discharging temperature (in °C)	
Lithium-ion batteries	600 to 3,000	3.2 to 3.7	100 to 270	250 to 680	80 to 90	3 to 10	0 to 45	-20 to 60	Safe
Lead-acid batteries	200 to 300	2.0	180	50 to 95	50 to 95	5	-20 to 50	-20 to 50	Generates harmful gases
Nickel-metal hydride batteries	350 to more than 3,000	1.2	250 to 1,000	65	65	30	0 to 45	-20 to 65	Safe

Source: [Liu, Kailong, Kang Li, Qiao Peng, and Cheng Zhang. "A brief review on key technologies in the battery management system of electric vehicles." *Frontiers of mechanical engineering* 14, no. 1 \(2019\): 47-64.](#)

Ultra capacitors

Apart from batteries, ultra-capacitors are also used as energy storage systems in EVs. [Ultra capacitors](#), also called supercapacitors and electrochemical capacitors, store electrical energy electrostatically. High specific power, high [capacitance](#), good performance at low and high temperature, and long life cycle are the [unique characteristics](#) of super capacitors. Generally ultra capacitors are used as a secondary energy-storage device in EVs. [China](#) has taken the lead in making super-capacitors as the primary storage device in EVs. [A recent market analysis](#) came up with a finding that the overall worldwide ultra capacitors market will expand with a compounded annual growth rate (CAGR) of 28.23% between 2019 and 2027.

(to be continued...)

Tamil Nadu News

Solar developers get relief as APTEL quashes power regulator's unviable tariff order

The Appellate Tribunal for Electricity (APTEL) observed that Tamil Nadu Electricity Regulatory Commission (TNERC), in its Solar Tariff Order dated March 28, 2016, determined the tariff/capital cost without cogent or adequate reasoning while also being divergent from its own regulations.

Lobby group National Solar Energy Federation of India Limited and Welspun Renewables Energy Private Limited had appealed to APTEL against Tamil Nadu Electricity Regulatory Commission's Solar Tariff Order dated 28.03.2016, citing that it adopted unrealistically low tariffs by arbitrarily determining the capital cost.

According to the appellants, the capital cost of Rs 5.05 Crore/MW independently adopted by TNERC "is significantly lower than the capital costs determined by the central and various other state electricity regulatory commissions [Rs 5.18 to Rs 6.15] and does not reflect the cost of electricity supply." After hearing the matter, APTEL has set aside Tamil Nadu power regulator's order and directed it to follow the CERC's final order on benchmark capital cost for discovering the fair tariff.

Further, in line with the methodology and principles adopted by central and various other state electricity regulatory commissions, TNERC has been directed to consider compensation for evacuation from the pooling sub-station at the generator's end, up to the grid sub-station, over and above the benchmark capital cost as considered by CERC. The appellants (NSEFI and Welspun Renewables Energy) contended TNERC's decision to adopt 90% of depreciation uniformly spread at the rate of 3.6% per annum over 25 years, saying that it impacted debt servicing and return on equity.

To this end, APTEL has directed the State Commission to re-compute depreciation by adopting differential method, while ensuring that aggregate depreciation provided is not less than the 90% of the capital cost. Noting that maintenance spares are an essential component for the efficient and continued operations of a solar generation plant, APTEL has directed TNERC to re-compute the tariff by factoring costs for maintenance spares in addition to module degradation and reduction of generation.

Source: [pv magazine](#), November 14, 2019

India News

EESL, SDMC ink pact to develop charging infra for e-vehicles

State-owned Energy Efficiency Services Limited (EESL) and civic body South Delhi Municipal Corporation (SDMC) on Wednesday signed agreement to develop charging infrastructure for electric vehicles in South Delhi Municipal Corporation Area.

The country is moving in right direction to achieve 175 GW of renewable capacity by 2022, Minister of Power and New and Renewable Energy R K Singh said at the event.

The MoU was signed here in presence of Minister of Power and New and Renewable Energy R K Singh, EESL MD Saurabh Kumar, Lt Governor of Delhi Anil Baijal, Municipal Commissioner of SDMC Gyanesh Bharti, among other government officials.

Energy Efficiency Services Limited MD said that under the MoU, EESL will install around 75 charging stations at different locations of South Delhi Municipal Corporation (SDMC) area. "In the first phase, EV charging station will be installed in 18 locations within 6 months from the effective date, selected through joint survey by both parties," he said, adding the tariff has been kept at Rs 4 per unit. "It is pivotal to establish a thriving public charging infrastructure to increase EV adoption and enhance consumer convenience. I strongly believe that a supporting infrastructure will surely enhance consumer confidence in electric vehicles in Delhi," Lt Governor of Delhi Anil Baijal said.

Source: [Business Standard](#), November 27, 2019

Consumer Focus

The Petitioner has two single-phase domestic service connections, out of which one service recorded a consumption of 860 units during one billing cycle. Based on the 860 units, the utility charged current consumption charges on 13.06.2017 at Rs.4156/-. An inspection of the historical consumption - last three bills - revealed consumption at an average of 213 units. Therefore, the petitioner contended that there was no excess usage of power during the period 12.04.2017 - 13.06.2017. The petitioner gave a written complaint to the Assistant Engineer (AE) regarding excess consumption recorded during the period. She also requested for testing of the energy meter and levy the current consumption charges based on the report. In the meantime, the consumer paid the disputed bill amount of Rs.4156 in order to avoid disconnection of the service.

With no response from the AE, the petitioner approached the Consumer Grievance Redressal Forum (CGRF) for redress. The respondent, utility, inspected the petitioner's connection. It found that the neutral wire of one service connection of the petitioner was unauthorisedly extended to the other service connection. Due to this, the service connection recorded a high consumption during the said period. Immediately the neutral wire was disconnected from the other service connection and the supply was normalised. Based on the inspection, the utility informed CGRF that the charges were right and based on actual consumption and that the petitioner had erred in unauthorisedly linking both service connections.

On hearing both sides, CGRF passed the order that the petitioner was to pay for the units shown in the meter for the reason that there was actual consumption due to the neutral being unauthorisedly extended from one service connection to another without the knowledge of the utility. The CGRF observed that this is not only illegal but this kind of practice is also unsafe as this will endanger both electrical instruments and humans.

ECC VOICE

என் பெயர் கஸ்தூரி. நான் திருவண்ணாமலை மாவட்டம், சின்னத்தம்பி நகர், வெங்கிக்கால் பஞ்சாயத்தில் வீடு கட்டியுள்ளேன். நான் என் வீடு கட்டுவதற்குத் தற்காலிக மின் இணைப்பு பெறுவதற்கான வழிமுறைகளை அறிந்து கொள்ள ECC திருவண்ணாமலையை அணுகினேன். அவர்கள் கொடுத்த ஆலோசனையின் பேரில் திருவண்ணாமலை மின் அலுவலகத்தில் எனது விண்ணப்பத்தைக் கொடுத்தேன். விண்ணப்பத்தைக் கொடுத்த 5 நாட்களில் எனக்குத் தற்காலிக மின் இணைப்பு கிடைத்தது. நிரந்தர வீட்டு இணைப்பைப் பெற, வீடு கட்டி முடிந்தவுடன் மின் அலுவலகத்தில் தெரிவித்தால் மீட்டர் பொருத்தப்படும் என்று தெரிவித்தார்கள்.

பின்பு வீடு கட்டி முழுமை அடைந்த நிலையில், மின் அலுவலக ஆலோசனையின் பேரில் மீட்டர் பொருத்தும் இடத்தை மட்டும் விட்டு வைத்திருந்தேன். தற்காலிக சர்வீஸை நிரந்தர சர்வீஸாக மாற்றி தருவதற்காக நான் மின் அலுவலகத்தை அணுகி எனது விண்ணப்பத்தை சமர்ப்பித்தேன்.

ஆனால், இரண்டு மாதங்கள் ஆகியும் நிரந்தர இணைப்பு வழங்கப்படாததால், தொடர்ந்து தற்காலிக மின் இணைப்பையே உபயோகப் படுத்த வேண்டிய கட்டாயம் வந்தது. இதனால் நான் மின் கட்டணம் ரூபாய் 700 அதிகமாக செலுத்த வேண்டிய நிலையில் இருந்தேன். இந்த நிலையில் நான் ECC திருவண்ணாமலையை அணுகி எனது பிரச்சனையைக் கூறினேன். நான் சமர்ப்பித்த விண்ணப்பத்தின் நகல் மற்றும் எனது புகாரையும் ECC திருவண்ணாமலையின் ஆலோசகரிடம் கொடுத்தேன். அவர் எனது புகாரை நிவர்த்தி செய்து தருவதற்காக சம்பந்தப்பட்ட அலுவலகத்தை அணுகினார்.

ECC திருவண்ணாமலையில் புகார் கொடுத்த நான்கு நாட்களில் நிரந்தர இணைப்பு வழங்கப்பட்டு, மீட்டரைப் பொறுத்த மின் அலுவலர்கள் வந்தனர்.

மின் இணைப்பு பெற சேவை வழங்கிய ECC திருவண்ணாமலைக்கு எனது நன்றிகள்.

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Citizen consumer and civic Action Group (CAG) is a non-profit, non-political and professional organization that works towards protecting citizen's rights in consumer and environmental issues and promoting good governance processes including transparency, accountability and participatory decision making.

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World News

China aims to boost revenue for renewable power firms

China plans to make power purchasers take fair returns into account when buying electricity from renewable power generators, according to a draft rule issued by the National Energy Administration on Monday aimed at improving their revenues. The draft rule will apply to non-hydropower resources, including wind, solar, biomass, geothermal and ocean power, the energy body said in a statement.

Despite rapid expansion and a drastic fall in the cost of producing power, renewable firms are still struggling to produce power as cheaply as coal-fired plants. China said last week it will cut its renewable power subsidy by 30% to 5.67 billion yuan (\$800 million) in 2020, and plans to stop funding large solar power stations and onshore wind farms in the coming two years, partly due to a payment backlog.

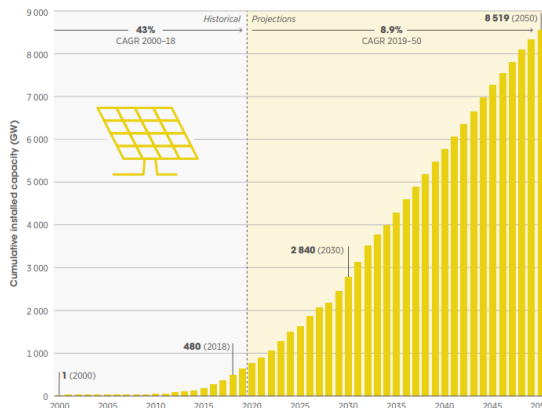
China, the world's largest energy consumer, has been boosting consumption of clean energy by forcing grid firms to prioritise renewable power resources and to maximize purchases from local renewable power providers. In future, local energy administrations would also need to take into account "fair returns" for renewable power producers, the National Energy Administration said in the draft rule.

Source: [Reuters](#), November 24, 2019

Publications / Regulations

- Guidelines for implementation of Component - C of PM-KUSUM Scheme on Solarisation of Grid-connected Agricultural Pumps, [Ministry of New & Renewable Energy \(MNRE\)](#), November 2019
- World Energy Outlook 2019, [International Energy agency \(IEA\)](#), November 2019
- Future of Solar Photovoltaic, [International Renewable energy Agency \(IRENA\)](#), November 2019
- SDG 7: Data and Projections, [International Energy Agency \(IEA\)](#), November 2019

Global solar projections compared to 2018 levels



GW - Gigawatt

CAGR - Compound Annual Growth Rate

Source: [International Renewable Energy Agency \(IRENA\)](#), November 2019