APRIL,2021

VOL. 1 ISSUE 1

RENEWABLEIUM

Shaktisteller Energy Solution's company newsletter for the renewable energy enthusiasts in collaboration with Ulaunch

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GO GREEN GO SOLAR

Established in the year 2016, Shaktisteller Energy Solutions Pvt. Ltd. is an ISO 9001:2005 certified company working in the field of Renewable Energy in Bhopal. This well-known establishment acts as a one-stop destination servicing customers on Solar rooftop, Solar Integrated Streetlights, EV's and Biogas in both Madhya Pradesh and Maharashtra.

PREFACE

The first Industrial Revolution started in Britain around late 18th century when steam power and water power transferred manual labour to machines in factories and led to the massive railroad expansion. The 2nd industrial revolution came in the early 18th century when internal combustion engines and electrical power generation were invented. It gave rise to automobile industry and the power sector. The 3rd industrial revolution took place in 1990s when automated production systems were used and led to the consumer electronics sector of business. Our living standard improves at cost of higher energy consumption that directly impacts our environment. Renewable energy sector has the capability of being the next industrial revolution. Renewable will certainly revolutionize our life and must be implemented with considerations of our quality and sustainability. As always, we hope to bring you the best experience with technology.

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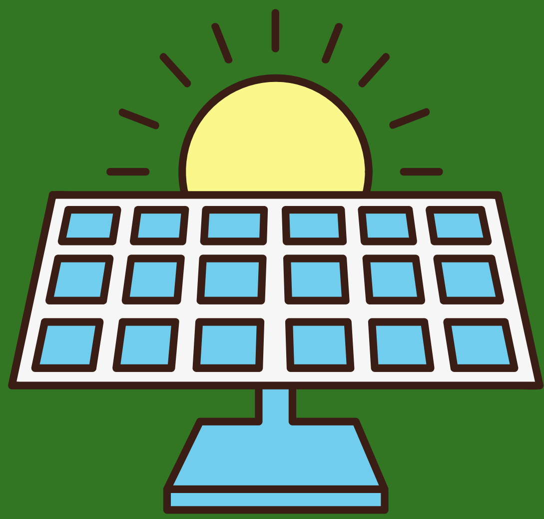

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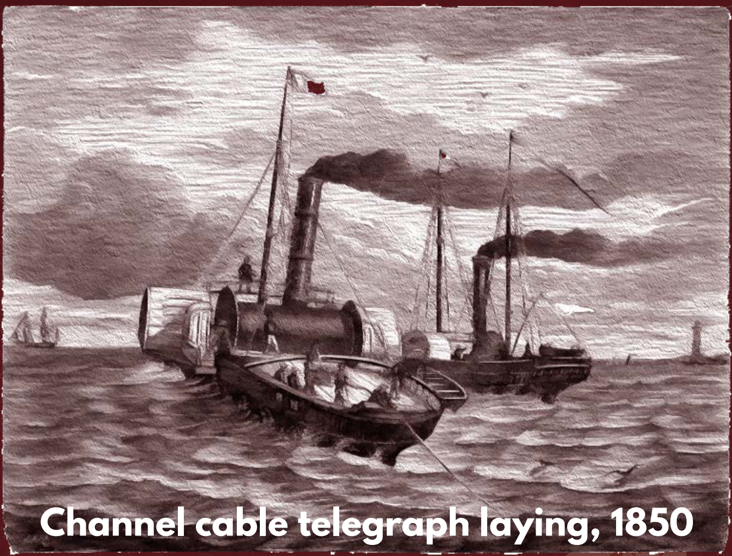
HISTORY AT A GLANCE


Channel cable telegraph laying, 1850

It was the year 1848 and a young Englishman, Willoughby Smith started to work as an electrical engineer for a private telegraph cables lying company in London. The company manufactured and laid underground and submarine telegraph cables insulated with natural rubber.

Willoughby, in 1850 supervised a thirty-mile-long underwater telegraph cable which failed the test of time almost immediately. He then developed a system to test the circuit continuously so as to avert another catastrophic failure. For his test circuit, he used a semi-conducting material with a high resistance and selected selenium rods for this purpose. The selenium seemed to do the job properly, except in actual use, the device gave inconsistent results. Upon investigation, it was discovered that the conductivity of the selenium rods increased significantly when exposed to strong light.

Smith described the "Effect of Light on Selenium during the passage of an Electric Current" in an article that was published in the 20 February 1873 issue of Nature. This paper was noticed by the most notable physicist of all times after Sir Issac Newton, Mr. James Clerk Maxwell, the progenitor of the Maxwell's equation that defines the electromagnetic phenomenon we know as light.

It all seems so predestined that the man who defined Light must notice the photoconductive effect and so it was. Maxwell wrote to a friend in a letter in 1874, "I saw conductivity of Selenium as affected by light. It is most sudden. Effect of a copper heater insensible. That of the sun great." The wheel had been set in motion.
In next issue we will explore the experiment carried out by Willoughby Smith and the other developments that led to the discovery of photoconductivity.

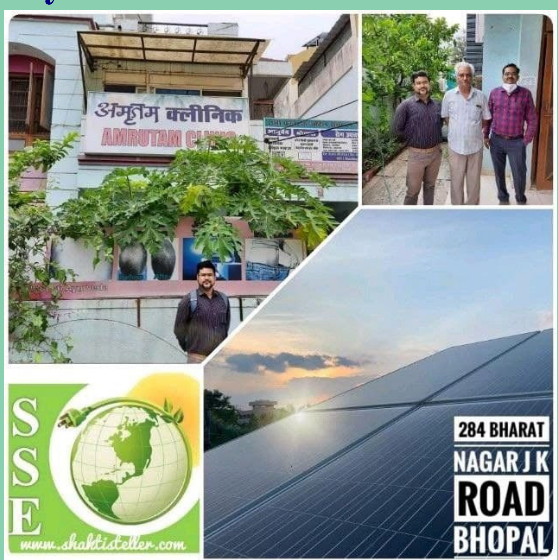
FEATURED PROJECTS

GURUDWARA AT NEW MARKET, JAWAHAR CHOWK, BHOPAL.

A 9 kW solar rooftop unit installed with 1,350 kWh units of clean energy. Utility bill reduced to 250/- per month from 11,000/- per month.

RENUKA MATA SANSTHAN, NAGPUR.

An 8 kW solar rooftop unit installed with Panasonic Mono-perc half cut technology and state-of-the-art Delta inverter with a capability to deliver 1,200 units of energy worth Rs. 9,000/- every month.



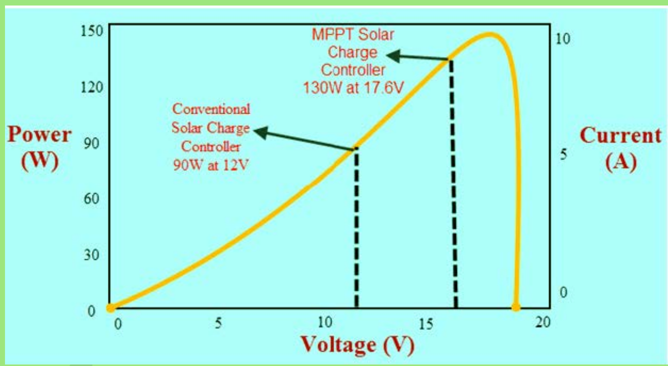
AMRIT CLINIC, BAWADIA CALAN, BHOPAL

A 5 kW solar rooftop unit installed that generates energy worth Rs. 6000/- for a month with Vikram Mono-Perc Panels and Delta inverter.

MAXIMUM POWER POINT TRACKER

The output power from a solar panel is determined by several factors: the irradiance level, the operating voltage and current of the panel, and the load. The output voltage is not stable enough to provide a constant power (power is the product of voltage generated and current delivered) and hence cannot be used for applications which require a constant voltage at the bus (almost every electric powered device we use) and so, a way to stabilize and provide a stable output with better efficiency and higher power delivery is as important as the energy itself.

Consider a PV panel that has a nominal 12 volts output for the purpose of our discussion. In practical appliances, all *12 volt* solar panels are designed to generate a peak voltage in the range of 16 to 18 volts and an open circuit voltage of approximately 19 volts. The problem is that a nominal 12-volt lead acid battery is at actual 12 volts. (10.5 to 12.7 volts depending on state of charge). Under charging mode, most batteries take from around 13.2 to 14.4 volts to fully charge which is a bit different than what most panels are designed to generate. The panel has a rating of approximately 7.4 amperes of current, it we assome a 130 watt solar panel. When the battery is at 12 volts under charge: 7.4 amps times 12 volts = 88.8 watts. Over 41 watts is lost. These 41 watts are never generated because there's a poor match between the source and the load. That lost power gets converted into heat and adds to the system losses.



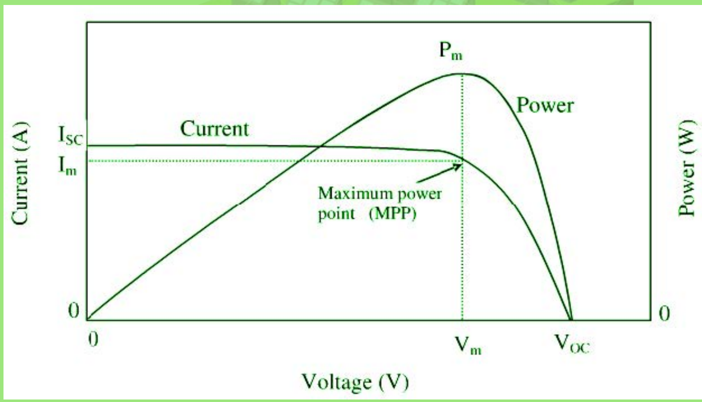
Maximum Power Point Tracking is a digital tracking method that stabilizes and increases power transfer as the name suggests. It is very different from the concept of '*maximum power transfer theorem*' used in the analysis of networks. The charge controller *observes* the output of the panels and compares it to the battery voltage. It then figures out what is the best power that the panel can put out to charge the battery. Most modern MPPT's are around 93-97% efficient in the conversion. The output is typically a 20 to 45% power gain in winter and 10-15% in summer. Actual gain can vary widely depending weather, temperature, battery state of charge, and other factors. Continuing our example, assuming the battery is low, at 12 volts an MPPT takes that 18 volts at 7.4 amps and converts it down so that what the battery gets is now 10.8 amps at 12 volts.

In real life, that peak moves around continuously with changes in light conditions and weather.

PRACTICAL MPPT SOLUTION

The Power Point Tracker is a High-frequency DC to DC converter. They take the DC input from the solar panels, change it to high-frequency AC, and convert it back down to a different DC voltage and current to exactly match the panels to the batteries. The LT 8491 from linear technologies provides an automatic MPPT with no software or firmware development.

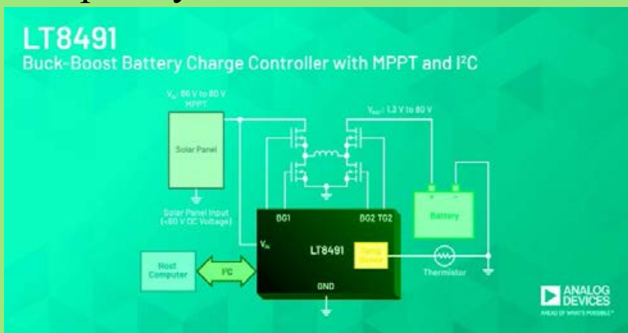
The two-stage power conversion is currently the most common approach to cope with a wide input dc voltage range produced by the PV panel. In that case, the PV power conditioning system consists of the front-end dc-dc converter for the MPPT and the inverter to feed the power to the ac load or grid.



BUCK-BOOST BATTERY CHARGE CONTROLLER

When powered by a solar panel, the LT8491 employs a proprietary Perturb and Observe algorithm for identifying the maximum power point. This algorithm provides accurate MPPT for slow to moderate changes in panel illumination. The panel is also scanned periodically to avoid settling on a false maximum power point for long periods of time, in the case of non-uniform panel illumination.

MPPT is an adaptation of dc-dc switching voltage regulator. Coupling to the load for maximum power transfer may require either providing higher voltage at a lower current or lower voltage for higher current. LT8491 is an mppt chip that doesn't need any programming and is a completely hardware driven circuit.



Source:Electronics Weekly

SPECIFICATIONS

Electrical parameters	Tracer1210A	Tracer2210A	Tracer3210A	Tracer4210A
Nominal system voltage	12V/24V auto work			
Rated battery current	10A	20A	30A	40A
Rated load current	10A	20A	30A	40A
MPP voltage range	VBAT+2V~72V			
Max. PV open circuit voltage	100V at minimum operating environment temperature 92V at 25℃ environment temperature			
Max. PV input power	12V 130W	12V 260W	12V 390W	12V 520W
	24V 260W	24V 520W	24V 780W	24V 1040W
Self-consumption	≤20mA(12V), ≤16mA(24V)			
Temp. compensation	-3mV/℃/2V			
Grounding	Common positive			
Overall dimension	172x139x44mm	220x154x52mm	228x164x55mm	252x180x63mm
Net weight	0.6kg	1.1kg	1.2kg	1.9kg
Enclosure	IP30			
Working temperature	-25°			

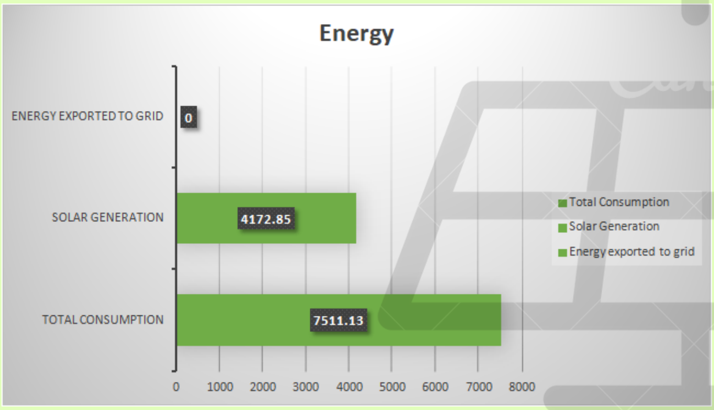
Source:SINOLTECH website

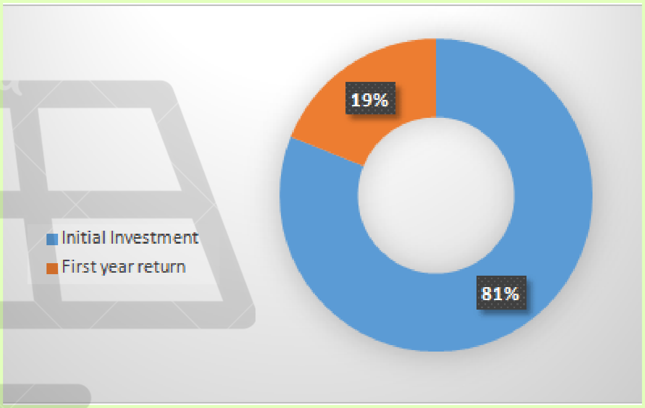
The LT8491 offers three selectable Constant Current Constant Voltage (CC-CV) charging profiles, making it ideal for charging a variety of battery chemistry types including sealed lead acid, gel and flooded cells, and Li-Ion in a small *7 mm* x *11 mm* x *.075 mm* 64 pin package.

SBI SOLAR UNIT–CASE STUDY

In the month of January, 2021 Shaktisteller Energy Solutions installed a 30 kW solar plant in State Bank of India, HET branch, Piplani, Bhopal which was phenomenal in saving 60 % of the energy. The unit consumption of electricity from September to December without the usage of Solar Plant ranges from 9000 kWh to about 15000 kWh. The electricity bill for the previous two months before installing solar plant was 1.5 lac on an average.

After the installation of 30kW solar plant, 6210 kWh units were used from the state electricity board and the rest 4050 kWh was supplied from the solar plant. The electricity bill reduced to ₹73,611 for the month. The cost of installation will be repayed in 5 years and an appreciable income for the rest 20 years is guaranteed.





The panel deterioration rate is 1% and an extra 0.2% accounts for potential-induced performance degradation (PID) in photovoltaic modules caused by stray currents and other factors. Taking in consideration 1.2% degradation, if a 30kW panel is installed, after a year it would degrade to 29.64 kW and after five years it will degrade to 28.242 kW. The energy value also depreciates from 54,000 kWh to 51,545 kWh. It is safe to assume a 0.2% degradation due to PID for the life of the panels and a 1% degradation every year for the first twenty years limiting the system to 80% of the total capacity.
While the plant can generate 50,074 kWh of Electricity annually, the bank's annual consumption is of 90,133 kWh. Hence, the system allows the bank to save approximately Rs. *3.5 lac per annum*. The 30 kilowatt solar rooftop installd provides 4500 units of monthly energy and saves *6.6 tonnes of coal* equivalent in a year. It equals to about *12,500 kg of* CO_2 emissions saved every year. The installation of a solar plant and the benefits of green energy are evident in this study and are seen to be cost effective as well as energy-saving.

Charu Monga- Brightening Lives via Innovation

IIT Prof, Charu Monga, Designs Over 200 Backpacks with Solar Lights To Help Kids in Villages Study.

"It's fascinating how nature finds its way through the darkness. I found Jugnu the same way." says Charu Monga, a professor of design at IIT. Her innovation has brightened the lives of the children in living in remote hilly terrains where electricity is not readily available. She has incorporated solar light into a water-resistant backpack made of recycled plastic which children carry to school.

In the northeastern part of the subcontinent, the sun sets quite early. Infrequent power supply obstructs the children's learning and playing time. Charu Monga has been conducting frequent workshops in the area that will help the community develop an innovative mindset. It was while interacting with a child during one such workshop, this obstruction was brought forth and she responded through innovation.

The solar light incorporated into the bag is charged as the children walk to school in broad daylight. This light can, later on, be taken out from the bag and be used as a torch or a power source. The bag pack also comes with innovative lab kits to spark the fuel of innovation in young minds. Charu's desire to ignite the innovative spark is evident through her setting up of community innovation hubs that provide access to "Virtual Reality headsets and well-curated course content" that motivate children to innovate. "Jugnu is not just a backpack, it is a philosophy that helps you achieve whatever you dream of, " says Charu

Charu Monga- Brightening Lives via Innovation.

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Article by Vihita Nevatia, Team ulaunch.