



# Resourcing 12 V Solar Based DC To 5 V, 15 V and 18 V DC

Dr Dinesh V Kala

dinesh.kala@gnkhalsa.edu.in

***Abstract:*** Direct current electric power is an emerging disruptive technological area that has the potential to stimulate economic growth, inspire innovation, increase research opportunities and ensures environmental sustainability. Load runs on DC are DC loads. Some common examples are laptop batteries; cell phone batteries and DC powered LED lights etc. Advantages of relying on energy from photovoltaic are many, no fuel cost, no noise, no emissions, no pollution and per unit cost of electricity is almost 25% of the conventional electricity. The innovation in this research to use the DC voltage obtained from solar panels to run the various DC loads, rather than converting the solar panels' DC into 220 V AC using inverter, converting higher voltage AC into lower voltage AC employing a step down transformer, converting AC back to regulated DC using rectification, filtration and regulation and so on, however, at each stage & at every interface there is appreciable loss of energy. Moreover, higher voltage AC needs to be stepped down using transformers before it can be used to recharge a device like mobile phones, laptops, EVs etc.

**Keywords:** Buck & Boost, CVS, Photovoltaic.

***Introduction:*** From photosynthesis to photovoltaic sun has its own significant and magnificent role. Present concerns regarding climate change have compelled us to think about clean sources of energy, the discovery of photovoltaic has revolutionized the way we harness solar energy. Alternating current has its advantage of transport over longer distances, however, the introduction of solar panels has solved the distance transportation of DC as well by installing solar panels close to utilization. Everybody loves uninterrupted electric supply for one reason or other, may be a professional, a teacher, a student, a researcher and so on. In the recent time of pandemic, the significance of electricity and its availability has realized to altogether at different level. Moreover, solar based standalone systems are very useful without any choice even for the areas which are deprived from

utility. One can simply store solar based DC power in the appropriate size batteries and then use power DC to run DC based loads and appliances.

### Experimentation:

Most of the circuits in the physics laboratory runs on fixed or adjustable regulated power supplies. For example, TTL based circuits and ICs runs on 5V, transistor based circuits runs on 18 V & 555 timer-based circuits runs on 15V supply and so on. This research paper is an outcome of purely experimental work. The innovation in this paper is a 12V 26Ah battery is used to store the energy from the solar panels. However, we need 5V (for TTL circuits, 15V (for 555 Timer based circuits, 18V (for Transistorized Circuits). The problem was resolved by using appropriate buck and boost circuits and everything is on standalone PV system. In this project we used one buck-boost circuit for buck and boost. The concept can be extended to each buck-boost circuit dedicated to every voltage, in turn can be used to run various circuits. Research laboratories faces power cuts should use the solar energy for interrupted electric supply. We are fortunate enough that our country falls in tropical zone with plenty of sunshine throughout the year. Moreover, solar based electricity can run water pumps, ovens for heating purposes and refrigerators for cooling. Hence the above methodology is scalable to run high powered devices also.

### Experimental Setup:



80 W 12V Photovoltaic



12V 26 Ah Storage

## 12V Solar Battery



12V Solar Battery Resourced to  
15 V @ Boost Circuit

For 555 timer based Experiments



12V Solar Battery Resourced to  
5 V @ Buck Circuit

For TTL based Experiments



12V Solar Battery Resourced to  
18 V @ Boost Circuit

For Transistor based Experiments

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