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**CHAPTER 4**

**Methodology**

**4.1 Block Diagram Explanation**

The circuit consists of the solar charge controller, battery management system (BMS), fuses, solar panels, and a system.

**4.1.1 Solar charge controller**

A charge controller is basically a voltage and/or current regulator to keep batteries from overcharging. It regulates the voltage and current coming from the solar panels going to the battery. Most "12 volt" panels put out about 16 to 20 volts, so if there is no regulation the batteries will be damaged from overcharging. Most batteries need around 14 to 14.5 volts to get fully charged.

**4.1.2 Battery management system (BMS)**

Battery management system is not controllers. Instead, they monitor your battery system and give you a pretty good idea of your battery condition, and what you are using and generating. They keep track of the total amp-hours into and out of the batteries, and the battery state of charge, and other information such as which battery pack is being damaged and which pack is overcharged or under charged. They can be very useful for medium to large systems for tracking exactly what your system is doing with various charging sources.

Battery management system (BMS) is a device that monitors and controls each cell in the battery pack by measuring its parameters. The capacity of the battery pack differs from one cell to another and this increases with number of charging/discharging cycles. The Li-poly batteries are fully charged at typical cell voltage 4.16 - 4.20 V. Due to the different capacity this voltage is not reached at the same time for all cells in the pack. The lower the capacity the sooner this voltage is reached. When charging series connected batteries with single charger, the voltage on some cells might be higher than maximum allowed charging voltage at the end of charging. Overcharging the cell additionally lowers its capacity and number of charging cycles. The BMS equalizes cells’ voltage by diverting some of the charging current from higher voltage cells – passive balancing. The device temperature is measured to protect the circuit from over-heating due to the passive balancing. Battery pack temperature is monitored by digital temperature sensor/s.

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**4.1.3 Solar Panel’s**

A solar panel is actually a collection of solar (or photovoltaic) cells, which can be used to generate electricity through photovoltaic effect. These cells are arranged in a grid-like pattern on the surface of solar panels.   
Thus, it may also be described as a set of photovoltaic modules, mounted on a structure supporting it. A photovoltaic (PV) module is a packaged and connected assembly of 6×10 solar cells.

**4.1.4 Fuses**

Fuses are used in the circuit so that the circuit should be protected from over voltage spikes that can damage the costly battery management system in our circuit.

**4.1.5 System**

A general system that is capable enough to run Scada software that will display the present/current values of the system i.e. battery charging percentage and charging/discharging rate through

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**CIRCUIT DIAGRAM**

*PROJECT TITLE*

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**Task assigned to the Software**

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**Algorithm**

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**Flowchart**