1. **Specification**
2. User Interface

* **5V DC USB charging port (Buy):** There is no switch, the user can just plug the USB cable.
* **2x 10W LED Lights (Buy):** The user does not have access to the electrical connections, they can only switch the light ON/OFF using a switch. They can also replace the damaged lights.
* **100V-220V Socket Outlet (Buy):** The outlet will be dual-pin plug with a switch.
* **Arduino LCD Display (Buy):** This will display charge level of a battery in percentage.

1. Requirements

* 12V-18AH Battery (Buy)
* 50W Solar Panel (Buy)
* Battery monitoring circuit (Build our own)
* MPPT charge controller (Build our own)
* 2x ATMEGA328 Microcontrollers (Buy)
* 5V DC/DC USB step-down module (Buy)
* Inverter for 220V AC (Build our own)
* Transformer (Buy)

|  |  |  |
| --- | --- | --- |
| **Vital** | **Necessary** | **Nice** |
| * Battery * Solar Panel * Lights | * Charger * Battery monitoring circuit * Display * Overload and short circuit protection * Lightning/overvoltage protection * Reverse power flow protection * UB step-down module * Arduino LCD display | * Socket outlet for TV * Dust detection system * Switch off heavy loads automatically if there is less power in the battery. |

1. **Energy Budget**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Appliance | Quantity | Usage time (hours) | Power (W) | Energy (Wh) |
| LED lights | 2 | 4 | 10 | 80 |
| Cellphone Battery | 1 | ~ 2 | 5.775 | 11.55 |
| 32-inch LED TV | 1 | 2 | 20 | 40 |
| **Total Energy** | | | | 131.5 |

**NB:** If the TV is not included, the number of lights will be increased or a radio will be put in place.

1. **Operation**

There will be a protection circuit for the battery to ensure that it does not overcharge or discharge completely. MPPT charge controller will ensure that we get the maximum power from the solar. At most two microcontrollers will be used. The LED lights are connected directly to the 12V line, the 5V USB charging system will be connected to 12V line via the regulator circuit to step down the voltage. Finally the an inverter system will be built since it is costly to buy one, so that 220V will be obtained from the 12V DC in the line.

