MICROCONTROLLER BASED INTELLIGENT SWITCH OVER FOR RENEWABLE SUPPLY

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Abstract:- Providing clean energy security has been one of the challenges our country is facing despite being endowed with numerous non-conventional energy resources. India has an ambitious target of achieving 100GW solar power capacity by 2022, of which 40GW is expected to come from rooftop solar projects. The intermittency and variability nature of renewable energy sources may result into wastage of renewable energy if intelligent interface and Technology assistance is not provided. Every home has solar rooftop facility installed today , but not able to use the maximum renewable power available, as they are able to meet only the basic load requirements.
This paper presents a Micro-controller Based intelligent Transfer   Switching System, that switches to Main supply from the renewable supply when required, monitoring the Load demands of a domestic facility.

1. INTRODUCTION

Automatic transfer switch is used to transfer the load from one state to another. In electrical terms , it is used to transfer load from one power source to another power source. This paper implements   a PIC Microcontroller based   automatic transfer switch, to transfer load from Renewable energy to AC main power, in case of any extra load being added. This kind of system is required because it's not possible to manually switch the loads to one/another state very often. Where a individual might not be able to decide which supply to be put in at different situations of loads requirements. An intelligent system has a capability to automatically switch the loads to renewable or mains based on current drawn by different loads.

2.PROPOSED SYSTEM

This project will monitor the load demands of the domestic facility & the renewable energy generated continuously, this will further be used to take necessary actions against availability or non availability of either source.
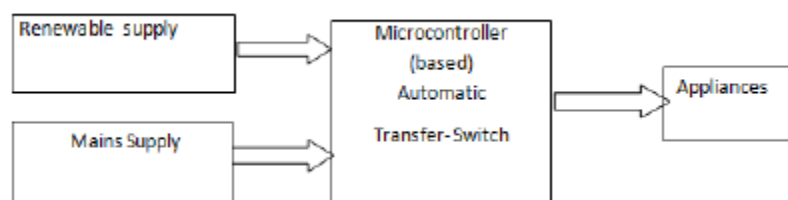
This project needs to measure 220V AC Mains supplied electricity board and Renewable AC generated to match it with the Load side demands because microcontrollers can't measure voltage greater than 5V, it needs to step down this voltage. If given voltage more than 5V to the analog input of microcontroller, it will get damaged permanently. To assure protection of microcontroller, system will need to step down 220 volt AC into AC voltage whose peak value should be less than 5V. For example , 220V AV mean RMS voltage and its peak value is equal to 311 volt. Similarly its required to step down high AC voltage of in such a way that its peak value should not be greater than 5 volt. The various components used are:
Potential transformer is a type of transformer which is used to step down ac voltage. It is used to measure ac voltage by stepping down AC voltage.

An LCD is used as a user interface device to see circuit configuration status and is also used to display digital values of voltage and current on liquid crystal display. Relays are used to transfer from one source to another based on actions performed by PIC microcontroller subjected to availability of sources. The code for PIC16F887 MCU is written in C language. It is compiled using MPLAB IDE version 8.91 and HI-TECH C compiler version 9.83.0.10920. The generated hex code is burnt into the MCU chip using MPLAB ICD 2 programmer board.

3.BLOCK DIAGRAM

This simple and very efficient Microcontroller - relay assembly in project will do all the functions automatically, silently and with great fluency. The shown positions of the relays are in the N/C directions, meaning the relays are not powered, which will be in presence of renewable AC input. At this position the DPDT relay will be connecting to the renewable AC output, which is given to the appliances through its N/C contacts.

Now let's assume that AC mains is needed for a particular load that draws more current is switched On , this will instantly be known by microcontroller and that particular relay now becomes operative(the relays instantly becomes active and switches from N/C to N/O) and supplies the Main power to that particular load.
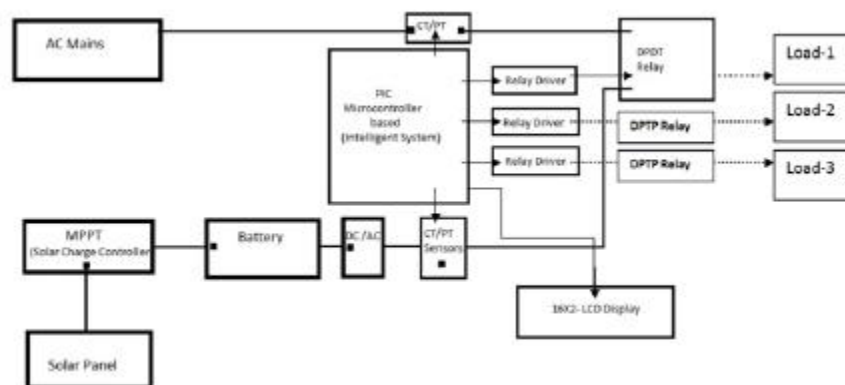
Suppose our renewable facility can only provide enough power(say X kw or Amperes) for 3 loads. The intelligent system knows that, since the 3 loads are drawing the same current , as it is generated by renewable source, it will be into renewable source only. As soon as one more load is put, (that is drawing (X/4) amount of power(or current), our intelligent system decides to excite only that particular load's relay to AC-mains, so that , (X/4) amount of current rating will be separately drawn from AC Mains. As few more loads are switched on, or at peak

time , when many loads of X, (X/2), (X/4) all may be operating at the same time, this intelligent system will excite the remaining sets of DPDT relays to AC mains too.

Thus at any point of time, this system will always keep the default loads connected to the renewable source.

4. COMPONENTS
Hardware:-
PIC Microcontroller - (PIC 16F887 MCU)
DPDT Relay ☐ 16X2 LCD MODULE
CT/PT sensors
Connecting Wires ☐ etc.
Software and Simulation:-
PIC compiler MPLAB - IDE (8.9.1)
MPLAB -ICD 2 Programmer board
PSPICE or Simulators

6. RESULTS
It is observed that everything takes place automatically when the appliances are loaded/switched On.The load demands and available renewable power generated are monitored with the help of CT/PT sensors which in turn helps in adding only the required amount of power to the AC Mains , which will be in actual other than those being operated by Renewable power generated..A load is reverted from renewable AC to AC- Mains and vice versa.

The major advantage of this system is, this system would help fully utilize the renewable energy produced by any solar rooftop installment/facility.

7.CONCLUSION
The Load's currents are continuously monitored and in the likely event when the load increases, the connected appliance is instantly diverted from the renewable AC to the AC mains, within a split of second such that the appliances doesn't even blink, giving an impression that nothing had happened and without any interruptions rest all are operative by renewable power continuously.

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