Implementation of Power Scheduling of Consumer Appliances Using Embedded Systems

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ABSTRACT:

An Optimal Power Scheduling Method for Demand Response in Energy Management System is designed based on IEEE Transactions on Smart Grid, Vol. 4, No. 3, September 2013. With the development of smart grid, the grid has the opportunity to schedule its power supply for the purpose of reducing the power peak-to-average ratio (PAR). The grid is programmed to supply the energy in predefined schedules according to the RTC time set based on the demand response (DR). The loads are categorized into two; one is Manually Operated Appliances (MOA) and Automatically Operated Appliances (AOA). The length of operation time of AOA loads are divided into parts and scheduled using RTC to reduce power peak-to-average ratio. This project benefits to utility companies is the reduction of the PAR which would increase the stability of the entire electricity system.

BLOCK DIAGRAM:

INTRODUCTION:

The word hybrid is used to refer to something made by combining different elements. Modern science has seen dramatic advances in hybrid technology, giving birth to hybrid cars such as the Toyota Prius and incorporating information and communications technology (ICT) systems that automate smart-houses and eco homes.Similarly, hybrid energy systems have been designed to generate electricity from different sources, such solar panels and wind turbines. Hybrid energy systems often consist of a combination between fossil fuels and renewable energy sources, and are used in conjunction with energy storage equipment (batteries).This is often done either to reduce the cost of generating electricity from fossil fuels or to provide back up for a renewable energy system, ensuring continuity of power supply when the renewable energy source fluctuates.
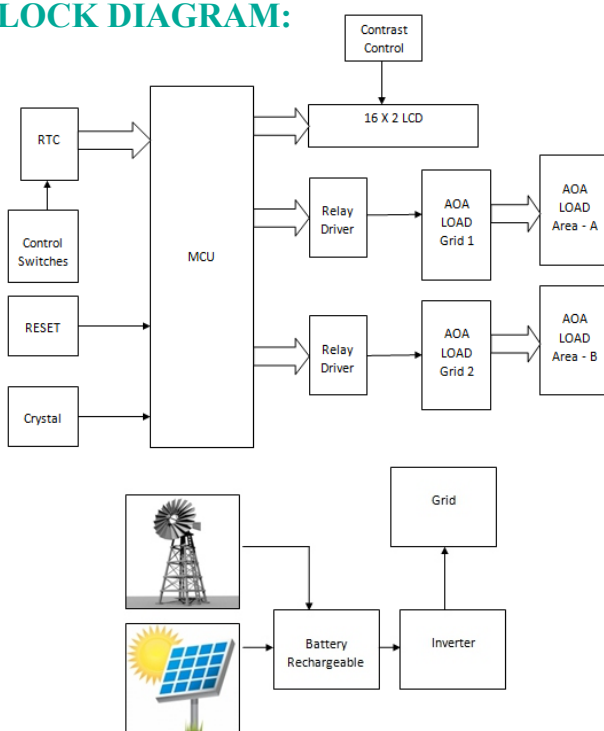
One of the biggest downfalls of renewable energy is that energy supply is not constant; sources like solar and wind power fluctuate in intensity due to the weather and seasonal changes .Therefore, a reliable backup system is necessary for renewable energy generating stations that are not connected to a national power grid.These systems consist of a variety of power control methods and storage equipment which include battery banks and diesel generators among others. The power systems that are connected to the national grid don't have this problem because, in most cases, there are many different sources of power contributing to the national electricity supply.

LPC 2148 Controller:

The LPC2148 are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. 128-bit wide memory interface and unique accelerator

architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.
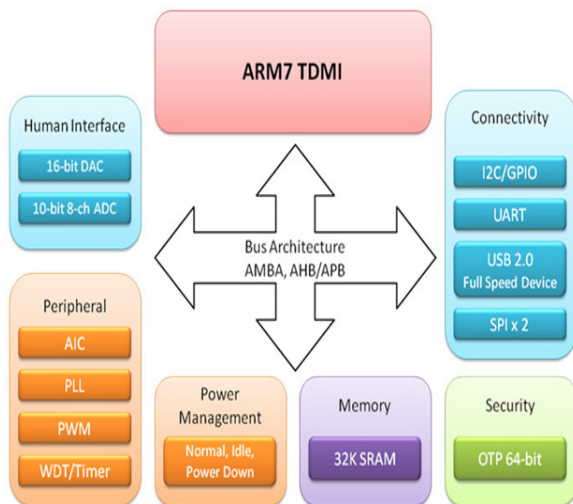
2. SOLAR ENERGY:

Solar energy is energy from the Sun. It is renewable, inexhaustible and environmental pollution free. Nigeria, like most other countries is blessed with large amount of sunshine all the year with an average sun power of 490W/m2/day [2]. Solar charged battery systems provide power supply for complete 24hours a day irrespective of bad weather. Moreso, power failures or power fluctuations due to service part of repair as the case may be is nonexistent.

3. WIND POWER:

Wind Power is energy extracted from the wind, passing through a machine known as the windmill. Electrical energy can be generated from the wind energy. This is done by using the energy from wind to run a windmill, which in turn drives a generator to produce electricity . The windmill in this case is usually called a wind turbine.

This turbine transforms the wind energy to mechanical energy, which in a generator is converted to electrical power. An integration of wind generator, wind turbine, aero generators is known as a wind energy conversion system.
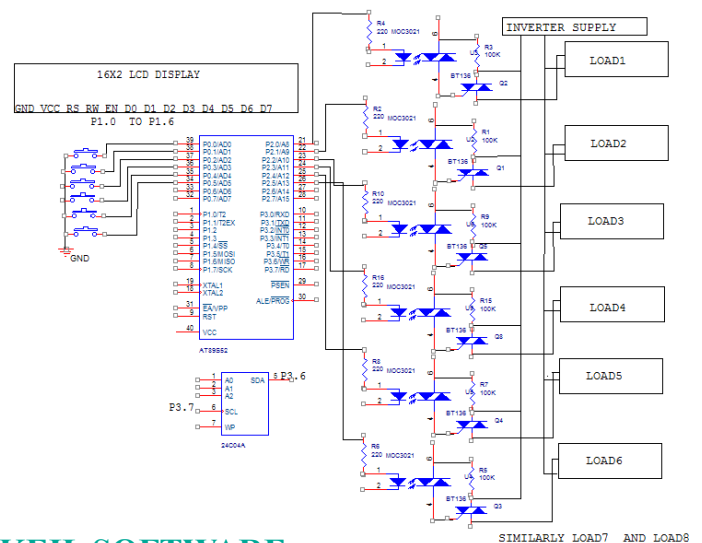
Inverter:

An inverter is an electrical device that converts direct current (DC) to alternating current (AC); the converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching, and control circuits.
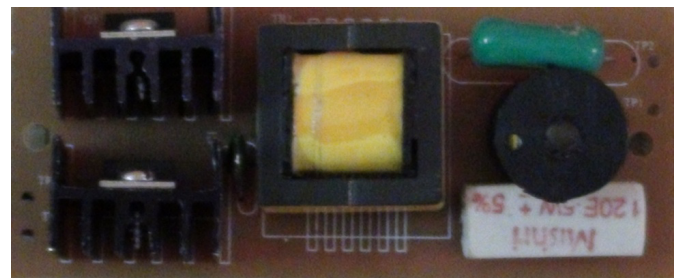

Real-time clock:

The RTC is designed to provide a set of counters to measure time when normal or idle operating mode is selected. The RTC has been designed to use little power, making it suitable for battery powered systems where the CPU is not running continuously (Idle mode).

KEIL SOFTWARE:

Keil compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.
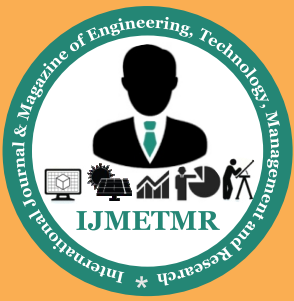
PROLOAD:

Proload is a software which accepts only hex files. Once the machine code is converted into hex code, that hex code has to be dumped into the microcontroller placed in the programmer kit and this is done by the Proload. Programmer kit contains a microcontroller on it other than the one which is to be programmed. This microcontroller has a program in it written in such a way that it accepts the hex file from the keil compiler and dumps this hex file into the microcontroller which is to be programmed.

CONCLUSION:

The project "An Optimal Power Scheduling Method for Demand Response in Energy Management System" is designed, tested and implemented successfully. Hence the grid is empowered by non conventional energy resources like solar and wind energy. 16 X 2 LCD display is to display the Grid status.