ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 6, June 2017

Active Demand Response Using Shared Energy Storage for Household Management

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ABSTRACT: In a deregulated market, wholesale energy costs and distribution investment costs contribute significantly to consumers electricity bills. However in a low carbon electrical power system, the two cost pressure points may not be synchronous in time and space with each other. This project develops a methodology for home area energy management as a key vehicle for demand response, using electricity storage devices. The aim is to enable energy storage at consumer premises to not only take advantage of lower wholesale energy prices, but also to support low voltage (LV) distribution networks for reducing network investment. They have the capability to maximize the overall savings in energy costs and investment costs. In the proposed approach, the operation of home-area energy storage devices is jointly conducted by end customers and network operators.

KEYWORDS: Step-down transformer, ARM7, Filter & Regulator, Relay.

I. INTRODUCTION

The development of any country depends to a large extent on availability and usage of electricity. Conservation of electricity has now become a vital element of economic growth giving benefit to state's exchequer and this conservation is more essential due to the concern for fast depletion of non-renewable sources of energy in the country.
This project develops a methodology for home area energy management as a key vehicle for demand response, using electricity storage devices. The aim is to enable energy storage at consumer premises to not only take advantages of lower wholesale energy prices, but also to support low voltage (LV) distribution networks investment. New operation strategies for domestic energy storage to facilitate demand response (DR) are developed in the paper. They have the capability to maximize the overall saving in energy costs and investment costs. In the proposed approach, the operation of home area energy storage devices is jointly conducted and network operators. The purpose is to fight for an optimal balance between DRs to energy price and to network congestion, and thus to maximize benefits for both consumers and network operators .An intensive study is carried out to investigate the impacts of different dispatch strategies on wholesale energy costs and network investment costs. Benefit quantification methods are introduced as well to evaluate the total benefits in terms of savings in energy costs and investments costs that can brought

II. METHODOLOGY

During the design of the active demand response, a lot of considerations, conditions and cases where considered which at the end give rise to the design of shared energy storage. These considerations along by the proposed operation approach.
Microcontroller- In the application development, microcontroller mainly meant for the function of the data processing, data storage, human interfacing and interoperability with the external environment. While developing any application platform on any microcontroller the things to that can be taken into account are:
a) To choose requirement specific microcontroller with further scope of up gradation.
b) To study development tools with their version specification.
c) To study and apply High Level Language specification for application development as per compiler variations.
The basic architectural & peripheral requirements for microcontroller are:-
a) Instruction and data are on the separate buses, increasing speed & overall performance.
b) While instruction fetching on program bus, data can be read or written on data bus.

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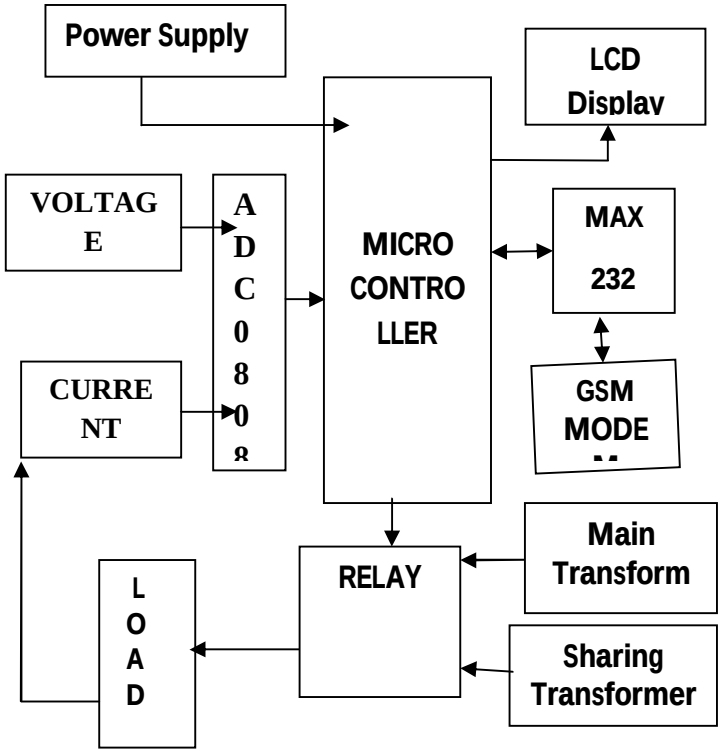
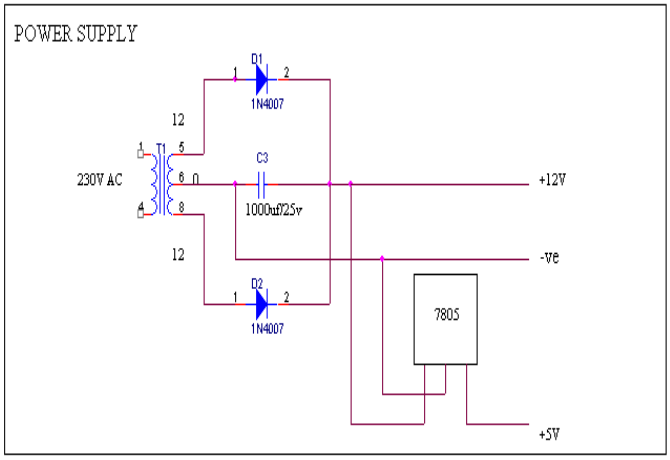
c) Program Memory Bus optimized to any widths that fit within the design goals of microcontroller.



III. BLOCK DIAGRAM

Power-supply- Requirement of power supply is the main task, power supply of +5V and +12V is required for the circuit. The supply of +12V needed for the Relay connections. And 7805 which has given +5V to the circuit. Power supply is generated after rectifying the step downed AC which again passes through filter capacitor & ripple eliminator circuits.



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As the step down transformer is used for providing the supply to the input channel through the variac (Dimmer stat) or AC Mains, Variac of rating 230V AC can be used to control and vary the voltage level as per the requirement.

Display- Use of 2x16 LCD Display, which has normally shows scrolling text. By using left justifying the higher four data bits are used for displaying the data, and Enable and RS pins are used for operating the LCD display. The R/W pin connected to ground because it is only used for busy check and that precision checked out by giving suitable delays. Pin1 is connected to the ground, pin 2 is connected to +5v and pin 3 is connected to the trim pot through resistor to improve the readability of the LCD and varies with the brightness of the surrounding.

GSM- GSM (Global System for Mobile communications) is the technology that underpins most of the world's mobile phone networks. The GSM platform is a hugely successful wireless technology and an unprecedented story of global achievement .

cooperation. GSM has become the world's fastest growing communications technology of all time and the leading global mobile standard, spanning 218 countries. GSM is an open, digital cellular technology used for transmitting mobile voice and data services. GSM operates in the 900MHz and 1.8GHz bands GSM supports data transfer speeds of up to 9.6 kbps, allowing the transmission of basic data services such as SMS.

IV. ADVANTAGES

- Automated load sharing by transformers
- No manual errors
- Fit and forget system
- Highly sensitive

V. APPLICATIONS

- Industrial applications
- Electrical Substations

VI. CONCLUSION

With this project we can avoid the breakage or failure of transformers from overloads by converting these overloads to other section of transformer. So, that transformer can constantly distribute power to the required regions.

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