Chapter 6
Implementation of Load Control for Smart Metering in Smart Grids

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ABSTRACT

The conventional energy meters are not suitable for long operating purposes as they spend much human and material resources. Smart meters, on the other hand, are devices that perform advanced functions including electrical energy consumption recording of residential/industrial users, billing, real-time monitoring, and load balancing. In this chapter, a smart home prototype is designed and implemented. Appliances are powered by the grid during daytime, and a photovoltaic panel stored power during the night or in case of an electricity outage. Second, consumed power from both sources is sensed and further processed for cumulative energy, cost calculations and bill establishment for different proposed scenarios using LABVIEW software. Data are communicated using a USB data acquisition card (DAQ-USB 6008). Finally, a simulation framework using LABVIEW software models four houses each equipped with various appliances. The simulator predicts different power consumption profiles to seek of peak-demand reduction through a load control process.

LIST OF ACRONYMS

AC: Alternating Current.
Ah: Ampere-Hours.
AMI: Advanced Metering Infrastructure.
As: Ampere-Seconds.

C: Coulomb.
DC: Direct Current.
DG: Distributed power generation.
DR: Demand Responce.
DPDT: Double Pole Double Throw.
DPST: Double Pole Single Throw.
DSM: Demand Side Management.
HAN: Home Area Monitoring.
HEMS: Home Energy Management System.
LAN: Local Area Network.
mA: Milliampere.
NC: Normally Closed.
NO: Normally Open.
PLC: Power Line Carrier.
PV: Photovoltaic.
RE: Renewable Energy.
RER: Renewable Energy Resources.
RES: Renewable Energy System.
RET: Renewable Energy technologies.
RF: Radio Frequency.
SG: Smart Grid.
SM: Smart Meter.
SPDT: Single Pole Double Throw.
SPST: Single Pole Single Throw.
ToU: Time of Use.
V: Volt.
W: Watt.
WAN: Wide Area Network.
Wh: Watt-hours.

INTRODUCTION

For a century, utility companies have used conventional power grid system to provide electricity, the traditional grid is facing numerous challenges including lack of techniques to automatically monitor the grid system and transfer useful data, besides with the ever increase in electricity demand and with the pressure from ever increasing energy demand and the reduction of fossil fuels, which pollute the environment, finding new energy resources and enhancing energy efficiency have become priority of many nations in the 21st century (Recioui & Dassa, 2017; Chellali et al., 2014).

Renewable Energies in general and solar photovoltaic (PV) in particular are a good alternative to ensure sustainability in the global energy production with environmental protection because it is a re-newable and a non-polluting energy source.

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