Chapter 10
Renewable Energy Distribution and Management in Green Buildings

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ABSTRACT

There are various environmental problems (i.e., "global warming," air and water pollution), which need to be prevented. Construction of buildings plays a significant role in pollution. To reduce the harmful effects in constructing buildings, it is necessary to move on to sustainable architecture. In this chapter, different advantages and standards for green buildings will be discussed. Different organizations are contributing towards a green environment. There are even different sensors that are able to detect wastage of energy and can predict the requirement of energy. Machine learning, a hot topic these days, can also play its role in demand prediction. In this chapter, role of network communication and sensing to optimize the energy of green buildings and machine learning-based demand prediction to optimize the energy of green buildings are discussed. Further predicting energy harvesting from weather forecasts, return on investment of green buildings, and potential benefits of energy-efficient green buildings are also discussed.

INTRODUCTION

Communities growth has a huge impact on the environment (Saunders, 2008).. Building any residential house or office actually affect the environment. The big question is that can buildings be made able to let pollutants spewed out which are harmful to nature. If people move to an architecture which is sustainable in nature, i.e.green buildings, then one can save the environment and also reduce the cost. Sustainable architecture seeks to reduce the harmful components and can reduce the environmental problems (Baird, Leaman & Thompson, 2012).. Sustainable built architecture is also termed as green buildings which are

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environmentally friendly and resource-efficient, whether it is to select the location of the demolition of these buildings after ending of their life cycle (Piomo, Atienza & Rosing, 2009).

The buildings which are used for living and office spaces should use natural resources for operation. The energy is consumed mainly in buildings while construction and later in electrical applications like lighting, fan or air-conditioning systems. While, these amenities like lighting, fan, air conditioning, microwave oven, water heating provide comfort to these building occupants, while consumes huge amount of energy and pollution gets added (Ganji, Budzisz,, Debel, Meo, Ricca & Wolisz, 2015). Further, occupant performs various activities which generate solid and water waste. Building green is too much efficient. It creates buildings which optimize using local ecology, local materials and most important thing is that these buildings are built so that it can reduce requirements of water and power.

Thus, keeping these things in mind, it has been realized that the traditional architecture used was very green. TERI has estimated that, if Indian urban area buildings, were made compulsory to adopt green building concepts, India could save more than 8,400 megawatts of power, which will be enough for lighting of 550,000 homes every year. To run the HVAC system efficiently, energy-efficient windows can be used, which locks the air coming in and block air which is outside from entering. A double entrance door can also be created to control climate system. Outdoor air temperatures affect the indoor. Here one door is used which leads to the entrance of a small room. This room is climate-controlled having other doors which leads into other parts of the building. Untreated air can be prevented from rushing in and rushing out using doors in the building every time the door gets opened. Unoccupied areas which get lightened can cause wastage of huge energy. The solution of these common problems while construction is installation of motion-activated lighting. These sensors work on a timer to provide its efficient nature. This is very useful for buildings having areas staffed 24 hours and areas which are only occupied while part of the day. Traditional switches get replaced through these automatic lights, so here is no risk of lights on by someone accidentally in unused area, and thus it ensures the lights are only running during needful.

There are a number of researchers which are working on these types of technologies. The example is the Recursive Deterministic Perceptron (RDP) neural network model. To detect and diagnose the faulty building energy consumption "Weather-Conditioned Moving Average (WCMA)" model can be used. This is a solar energy prediction algorithm based on different Exponentially Weighted Moving-Average (EWMA) estimation method. The amount of energy can be accurately estimated using WCMA algorithm. Strategically windows can be placed that skylight eliminates need for electrical lighting while the day. Figure 1 given below shows the green building with different energy utilizes and other resource utilization. Insulation of good quality reduces regulation costs of temperature in both season summer and winter (Fowler, Rauch, Henderson & Kora, 2010). . One can reduce emissions and consumption of water and thus contributes to make our ecological footprint smaller.

The sun offers huge solar energy potential which is carbon neutral and charge free. Technology for renewable sources of energy and commercially viable can cover completely the needs of building energy consumption. Figure 1 shows that the energy star appliances which can be used to reduce energy uses. Thus solar energy can play an important role in supplying power to green buildings in northern latitudes. One can also use photovoltaic (PV) and wind turbine systems. Many small on-site energy harvesting deployments at individual buildings can be used to generate electricity using Distributed Generation (DG). DG has potential to make more efficient generation by reducing transmission and distribution losses, carbon emissions, and demand peaks. Many countries like India are facing many issues. There are several initiatives are taken by the governments to frame some standards. Some of them are discussed as below: