Available online at www.sciencedirect.com

ScienceDirect

Energy Procedia 141 (2017) 255–259

Energy Procedia

www.elsevier.com/locate/procedia

4th International Conference on Power and Energy Systems Engineering, CPESE 2017, 25-29 September 2017, Berlin, Germany

Energy Performance Study in Thailand Hospital Building

Nattanee Thinate[a], Wongkot Wongsapai[b,] * and Det Damrongsak[a]

[a]*Faculty of Engineering, Chiang Mai University, Chiang Mai, Thailand*
[b]*Energy Technology for Environment Research Center, Chiang Mai University, Chiang Mai, Thailand*

Abstract

This paper focuses on the designated building in Thailand. According to the Energy Conservation Promotion Act 1992. This study draws attention to the energy utilization index (EUI) used to compare energy consumption and the finding of the efficiency. This is the initial energy assessment and the finding of the baseline setting of the energy consumption of buildings in the commercial, emphasizing on the hospital groups. From the energy consumption data of hospitals in Thailand, it is found that the relatively high power consumption is the top of the commercial because of its 24-hour service. To support the accident or emergency that might cause anytime and the use of high energy for the medical equipment and facilities for the service users. This study collects baseline data for 45 large hospitals, by using 2015 annual data, and it is representing 32.17% of total hospital energy consumption. Which is Multiple linear regression analysis is introduced to analyse factors affecting energy consumption which leads to the baseline setting analysis of energy consumption of large hospital buildings. It can also be used as a reference for future energy conservation planning.

Peer-review under responsibility of the scientific committee of the 4th International Conference on Power and Energy Systems Engineering.

Keywords: Energy Performance, energy utilization index, multiple linear regression analysis;

1. Introduction

The use of energy in Thailand has increased every year, especially the electricity in the year 2015; the use of electricity reaches 24.2% of the entire energy use for commerce [1]. In consequence, the assessment of energy performance is necessary for the standard measurement of energy use, which is important to the analysis of energy

* Corresponding author. Tel.: +66 81 6812002.
E-mail address: wongkot@eng.cmu.ac.th

1876-6102
Peer-review under responsibility of the scientific committee of the 4th International Conference on Power and Energy Systems Engineering.
10.1016/j.egypro.2017.11.102

saving and efficiency improvement of energy use [2]. In accordance with Energy Conservation and Promotion Act, B.E. 2535 (1992), it indicates that buildings and factories that exploit energy more than or equal to 1,000 KW or use the energy more than or equal to 20 million MJ must operate the energy management [3]. Thai's commercial business sector is one of the major economic group and using high energy, specifically, the hospital buildings due to the 24-hours services to support the accident or emergency that might cause anytime and the use of high energy for the medical equipment and facilities for the service users in compliance with energy data base [4]. In 2015, all 210 hospitals in Thailand spent electricity at 5,114.78 TJ and thermal energy at 612.85 TJ. This study selected the large hospitals for 45 places from the 210 hospitals. In 2015, the use of electricity is 1,616.74 TJ or 31.61% of the entire electricity use in hospitals while the use of thermal energy is 225.61 TJ or 36.81% of the entire thermal energy use in hospitals. The reasons that the study selected 45 hospitals were 1. using energy more than 3,000 KW or using energy more than or equal to 60 million MJ, and 2. having the complete data of energy use from 2010-2015. The study interested in Energy Utilization Index (EUI), analysis of energy use by Multiple Linear Regression Analysis for the analysis of the factors affecting the use of energy. This shall lead to the finding of the center line of energy use in hospital buildings for the comparison of energy use, finding the efficiency and primary evaluation the use of energy for the highest efficiency of usage and applying as the reference in the future energy conservation planning.

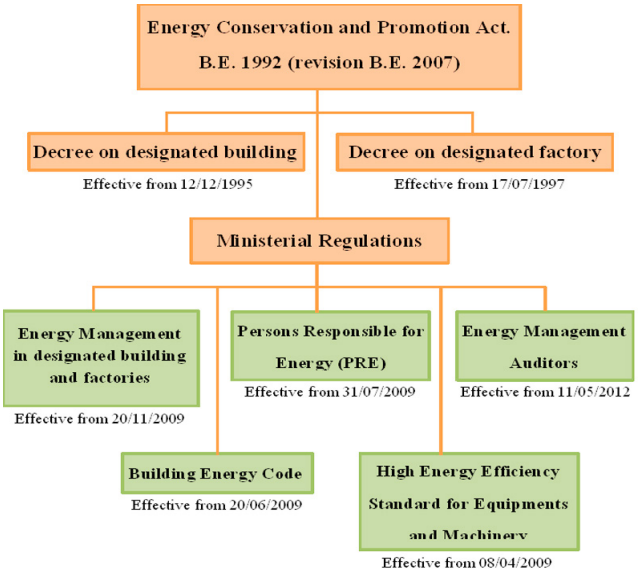

Fig. 1. Structure of the ECP Act and related regulations [3].

2. Background

2.1. Hospital Building background

Regarding 45 large scale designated building (hospital) from 210 hospitals in Thailand, they were grouped into 4 regions which are the north, the central region, the northeastern region, and the south. Each region has the different temperature and climate. Most of the selected hospitals in the central region are located in the hot climate throughout the year [5]; therefore, they become the factors affecting the energy use in the hospitals including the other factors that cause the differences among 45 hospitals, such as space, number of out-patients and in-patients and numbers of staffs.

2.2. Large scale designated building (hospital) breakdown

There are 45 large scale designated building (hospital) with the total energy 10,166.62 TJ, which uses electricity consumption 8,769.44 TJ and thermal consumption 1,397.18 TJ. Fig. 2. Consumption of presents the energy