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ScienceDirect

Energy Procedia 141 (2017) 228–232

Energy Procedia

www.elsevier.com/locate/procedia

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

Evaluation of Energy Saving Potential for Small and Medium Enterprises (SMEs) in Thailand

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Abstract

Thailand focused on the energy conservation in designated factories and commercial buildings for more than 25 years, by the promulgation of the Energy Conservation Promotion Act, B.E.1992. However, there are many enterprises (i.e. factories and commercial buildings) which are not in the regulation's target but consume high amount of energy. This study focuses on the potential energy saving from the so called SMEs (in energy pattern) in Thailand. By using on-site energy consumption and production survey to the 860 SMEs covering eight industry and six commercial building sub-sectors over the country and energy savings by using ODEX estimation, we found that the estimated energy conservation potential in factories and commercial buildings are 881.43 GJ and 442.94 GJ, respectively. Food and beverage, especially in food canning has highest energy reduction potential in industry while hotel and hospital has highest potential saving in commercial building. The obstacles of the energy efficiency improvement in SMEs are also discussed.

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

Keywords: Energy efficiency improvement; Energy conservation; SMEs; Thailand

1. Introduction

Thailand started her energy conservation in designated factories (DFs) and commercial buildings (DBs) since 1992, by the promulgation of the Energy Conservation Promotion Act, B.E.1992 (ECP Act) and applied the energy management system to the target [1]. Until now, we found that around 80% of total energy consumption in factory in

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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.2017.11.097

Thailand are from DFs. However, there are many enterprises (i.e. factories and commercial buildings) which are not in the regulation's target but consume high amount of energy. Hence, the study on energy conservation potential in the non-designated factories and buildings is also important. This paper consists of five parts; (i) introduction, (ii) the SMEs in Thailand and the survey concept and results, (iii)) energy conservation potential, and (iv) conclusion remark.

2. Thailand SMEs in energy pattern

2.1. Definition

Even the country has specific definition of small and medium enterprises (SMEs) [2] which include factory and commercial building [†]. But in this study, due to Thailand's Ministry of Energy has assigned and defined designated factories (DFs) and commercial buildings (DBs) from ECP Act, so, the SMEs, in energy pattern, means the factory (in industry sector) or commercial building (in service sector) which is not under the designated factory or building regulation. This means that the SMEs in this study means the enterprises that have electric power meter under 1,000 kW or total installed transformer under 1,175 kVA or annual energy consumption less than 20 million MJ per year [3], [4], [5].

In this study, we focus and survey in 860 SMEs around Thailand which includes 329 SMEs-factories and 531 SMEs-commercial buildings during the survey period from December 2016 to April 2017. Table 1 presents the survey sample details, by size and by type. It should be noted here that we also classified SME into two main types; (i) small enterprises which means power meter under 500 kW or total installed transformer under 585 kVA or annual energy consumption less than 10 million MJ per year, and (ii) medium enterprises which means power meter between 500 to 1,000 kW or total installed transformer between 585 to 1,175 kVA or annual energy consumption between 10 to 20 million MJ per year.

2.2. Energy consumption

From our on-site survey, the food and beverage sector plays an important role in industry sector while academic services are also mainly focused in building sector. We found that electricity has highest proportion in total energy consumption in commercial building while only LPG is used in cooking in department store, hospital and hotel. Table 1 presents the energy consumption from the survey, by energy types and by sector. We also found that some SMEs have not collected their energy and production data in good pattern, especially lack of thermal energy data collection including the efficiency of the major equipment and not-precise real production capacity. These obstacles also exist in most Thai SMEs due to the lack of energy conservation knowledge in their production or maintenance staff.

3. Energy conservation potential

There are two main method to estimate the energy conservation potential in SMEs; i.e. (i) the top-down concept which based on the broad sector estimation from the energy efficiency indicator such as specific energy consumption (SEC) or energy intensity (EI) and (ii) the bottom-up concept which based on the estimation from the engineering point of view and required energy audit in each enterprise [6]. In this study, we applied the top-down concept by using the specific energy consumption to estimate the energy conservation progress, equation (1) which adjusted from the ODEX concept. ODEX is the ODYSSEY-MURE project in European community country to measure the energy efficiency progress by main sectors [7], [8], [9].

[†] SMEs according to SMEs Bank was defined as follows (i) Manufacturing business including industrial production, mining, agriculture production particularly agricultural processing or (ii) Trading Businesses: wholesale, retail, import, and export. Each SMEs must has less than 200 million Thai Baht fixed asset or has under 200 number of employees [2].