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Procedia Engineering 8 (2011) 115–119

Engineering Procedia

2nd International Science, Social-Science, Engineering and Energy Conference 2010: Engineering Science and Management

Analysis of Energy Consumption and Behavior of Television in Resident Houses in Thailand

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Elsevier use only: Received 15 November 2010;revised 15 December 2010;accepted 20 December 2010

Abstract

Television is currently a common used electric appliance in most households, Energy consumption behavior of TV is crucial to be investigated in order that the surveyed data can be a useful guideline for future energy conservation. In this article, the author proposed the nationwide TV energy consumption information. A sample included 335 households whose television were actually installed and operated. The sample was derived by randomized sampling for different regions in Thailand, and was categorized based on television type and screen size. The obtained data was compiled as load profile. The analysis result ranged by different sessions of day demonstrated the household TV watching behaviors. The factor value indicated that television can be load factor impacting the overall energy consumption. This information as guideline is worthy for future energy conservation.

Keyword: Load Profile, Television consumption

1. Introduction

Regional energy consumption varies depending on the geographic characteristics, level of density, and incomes of people. In this study, the TV energy consumption in the households based on regions which included Bangkok, district of Bangkok, central, south, north, and northeast Thailand was explored and analyzed. The randomized sample included 335 households countrywide, subjected to the plan and policy on survey and analysis. Overall energy consumption for domestic electric appliances was summarized. Energy usage recorders were installed to each residential house for a purpose of recording the television energy usage for a continuous limited period. To know and understand the household TV energy consumption, the recorded data was analyzed to identify the

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1877-7058 © 2011 Published by Elsevier Ltd.
doi:10.1016/j.proeng.2011.03.021

television energy quality to see how energy consumption varied in 1-day and 1-week cycle. The analysis result for TV energy consumption quality was instrumental in respect of the power generation management so that the energy users can maximize the effectiveness of television usage[1]-[5].

2. Selected targets

In Thailand, the household energy consumption behavior was categorized based on demand of power usage and regional distribution. A number of 335 randomly samples were grouped based on geographic area and consumption type.

Regional Distribution	≤14"	15 - 21"	22 - 25"	≥26"	Total
BKK and vicinity	20	20	20	20	80
Central	16	16	16	16	64
North	16	15	16	16	64
Northeast	17	20	13	14	64
South	16	16	16	16	64
Total	85	87	81	82	335

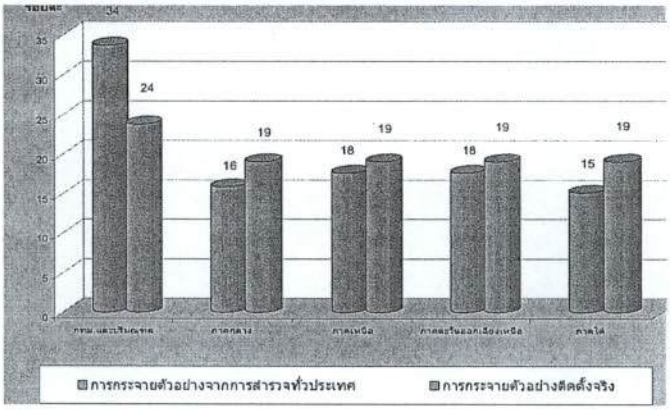


Fig. 1: Regional Distribution and Actually Installed Distribution

3. Formula for analysis

3.1 Wattage

Power wattage can be divided into three following categories; maximum wattage, average wattage, and minimum wattage.

(Maximum Wattage)

$$Maximum\ Wattage = \frac{\sum(Maximum\ load\ demand\ of\ each\ sample)}{All\ used\ load\ in\ group}$$

(Average Wattage)

$$Average\ Wattage = \frac{\sum(Aaverage\ load\ demand\ of\ each\ sample)}{All\ used\ load\ in\ group}$$

(Minimum Wattage)

$$Minimum\ Wattage = \frac{\sum(Minimum\ load\ demand\ of\ each\ sample)}{All\ used\ load\ in\ group}$$

3.2 Load Factor

Average to maximum wattage ratio for load in time session examined.

$$Load\ Factor = \frac{Average\ power\ of\ load}{Peak\ power\ of\ load}$$

3.3 Annual Usage Hour

Annual usage hour is referred to as number of use hours for load or electric appliance in 1-year period (h/yr)

$$h/yr = \frac{Used\ hours\ in\ consider\ time}{Total\ hours\ in\ consider\ time} x\ Total\ hours\ in\ a\ year$$

3.4 Annual Usage Unit

Annual usage unit is referred to as power use for load in 1-year period (kWh/yr) as the equation illustrated below;

$$kWh/yr = \sum (Average\ power\ [kW]\ x\ Hours/day)\ x\ Days/year$$

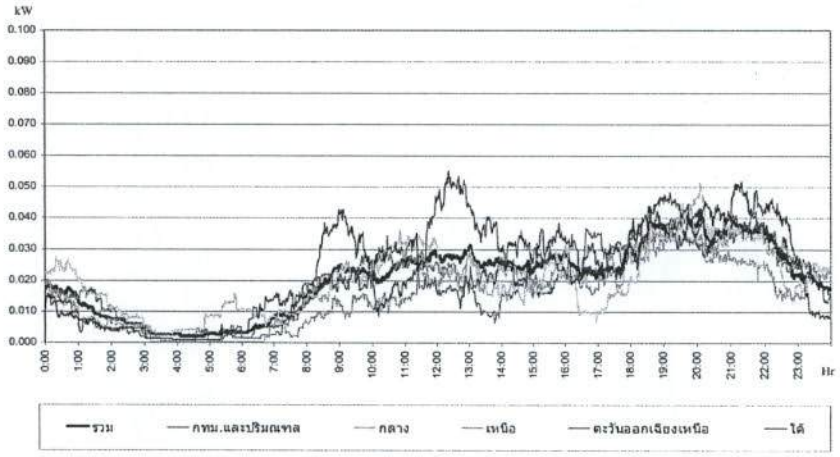
4. Analysis

Load profile represents in line graph showing the overall household power demand of television usage, which data was derived from the installed recorder that wattage was read every a minute for 7-day continuous period in daily load curve as shown in Fig.2(a) to (f).

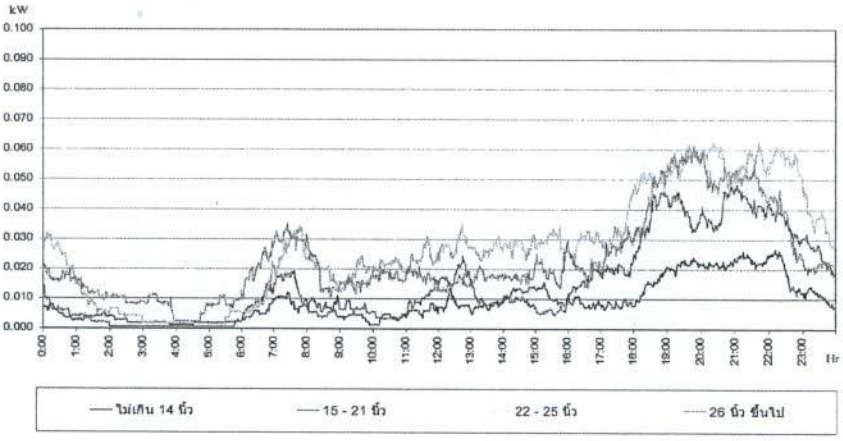
(a) Nationwide TV Load Profile (Monday – Friday)

(b) Nationwide TV Load Profile (Saturday – Sunday)

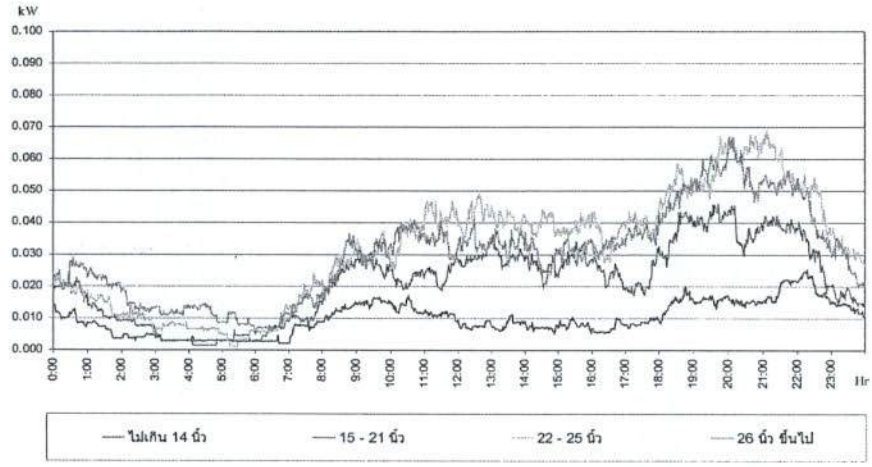
(c) Nationwide TV Load Profile ranged by regions (Monday – Friday)



(d) Nationwide TV Load Profile ranged by regions (Saturday – Sunday)



(e) Nationwide TV Load Profile ranged by screen size (Saturday - Sunday)



(f) Nationwide TV Load Profile ranged by screen size (Saturday - Sunday)

Fig. 2 Graph of the national TV load profile.

5. Conclusion

Overall, TV load profile ranged by region and daily session – 07:00a.m – 08:00a.m, 04:00p.m – 07:00p.m, it found that northeast households have demonstrated highest TV energy consumption. Also, northeast households have demonstrated highest TV energy consumption on weekends. TV energy consumption behavior varied from region to region. Noted that if TV watching behavior can be adjusted congruently throughout country, energy saving is feasible.

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