



*Strengthening local capacity
in the economic analysis
of environmental issues*

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Can Information Provision Help Households Reduce Their Electricity Consumption? A Study from Thailand

In Thailand, the residential sector is a major consumer of electricity. However, studies have shown that the overall electricity consumption of this sector could be significantly reduced, which can accordingly help the country meet its energy needs sustainably. To help policy makers select the best ways to deliver such positive changes, a new EEPSEA study has looked at whether the provision of information, particularly feedback on electricity consumption and energy-saving tips, can play a role in reducing the amount of electricity that Thai households use.

The study is the work of Kannika Thampanishvong from the Thailand Development Research Institute. It shows that telling people how their energy consumption compares with that of their neighbors significantly reduces their electricity consumption. It also shows that providing energy-saving “hints” has a positive (but much more modest) effect. The study calls into question the economic significance of information-based electricity conservation efforts and recommends for the government to consider helping electricity providers to adopt peer-comparison reporting.



A summary of EEPSEA Research Report No. 2015-RR18: ‘Using Feedback as a Tool for Household Energy Conservation: An Experimental Approach’, by Dr. Kannika Thampanishvong, Natural Resources and Environment Program, Thailand Development Research Institute, 565 Soi Ramkhamhaeng 39, Wangthonglang, Bangkok 10310 Thailand. Tel: +66-2-718-5460 ext. 415; Fax: +66-2-718-5461; Email: kannika@tdri.or.th

The need for energy conservation in Thailand

Over the past few decades, Thailand's rapidly expanding economy has driven significant growth in the country's electricity demand. This has accordingly driven the need to build more power generation capacity. Concern for electricity supply security and grid reliability has prompted the Thai government to pursue policies to expand planned capacity, to diversify fuel sources, to increase the use of alternative fuel use, and to promote demand-side management.

Successful demand-side management can help delay or offset the need for new power plants. It is therefore perceived to be a relatively cost-effective way to reduce greenhouse gases. As a result, Thailand has adopted a nationwide demand-side management master plan, and the Electricity Generating Authority of Thailand has implemented a number of demand-side management programs. Despite this, overall electricity consumption in the country has continued to grow over the past few years. The Thai government is therefore looking for further policy options to reduce consumption.

In 2013, the residential sector accounted for 23 percent of Thailand's national electricity consumption. Many studies have shown that there is a significant potential for electricity saving within this sector. To help highlight how such savings could be best made, this study focused on the impact of providing electricity-saving advice and feedback about households' electricity consumption on household electricity usage. In particular, it looked at the kind of information or feedback that has the most impact.

It is thought that this is the first study to have evaluated the impact of feedback on households' electricity consumption in Thailand. It was undertaken in order to give recommendations to the Metropolitan Electricity Authority (MEA), the Provincial Electricity Authority, and Thailand's Ministry of Energy about strategies that would help households to reduce their electricity consumption.

Looking at the impact of information on electricity use

The study used a field experiment to assess how the provision of energy-conservation information and feedback on electricity consumption

can affect households' electricity-conservation activities. It used statistical analysis to establish whether households that had been given this information experienced a reduction in their electricity consumption in comparison with households in a control group that had not been given any such advice.

The current study looked at the potential impact of information because previous studies have shown that the "invisibility" of electricity means that households usually receive little feedback on their electricity consumption. This can be likened to shopping in the grocery store in which no individual item has a price tag. Many electricity consumers have no idea whether their consumption is relatively high or low, or whether it has increased or decreased. Thus, providing feedback on households' electricity consumption may help address this information imbalance.

Selecting households for the field experiment

The households that participated in the study's field experiment were recruited from housing estates in the Minburi and Nongjok districts, which are residential areas on the eastern side of Bangkok. The two districts were selected for the field



Figure 1. Electricity consumption feedback report sent to Treatment 3 participants

experiment because these areas are comprised of households that have a wide variety of demographic and socioeconomic characteristics. After a preliminary data screening process, 161 households were chosen to take part in the study. The participating households were randomly placed into one of the four groups, which comprised one control group and three treatment groups.

The control group did not receive any form of feedback on their electricity consumption. The first treatment group received regular information on their own and their neighbors' electricity consumption. This information was provided in the form of a bar chart, which compares each household's own electricity use to that of a group of comparable neighbors. It also included messages designed to motivate action. This information allowed households to compare their monthly electricity consumption to that of families in similar-sized properties. The second treatment group received leaflets containing general advice on electricity saving. Households in the third treatment group received both types of information (i.e., comparison information and energy-saving tips). The households in the three treatment groups received their information periodically over a 10-month "treatment period" between November 2013 and August 2014.

Collecting baseline information on electricity use

To establish whether the information provided to the three treatment groups led to electricity savings, a comparison was made between households' electricity consumption in the pretreatment period (i.e., before they were receiving information) with their consumption during the treatment periods (i.e., when they were receiving information). The electricity consumption of households in the different treatment groups was also compared with the control group's electricity consumption. To facilitate this assessment, details of the pretreatment electricity consumption of all participating households (over a 12 month period) were obtained from MEA.

There were some differences in the pretreatment average levels of electricity consumption among the control and the three treatment groups. However, the mean electricity consumption of the four groups moved in the same direction during the pretreatment groups. For instance, the mean electricity consumption of all groups declined between November 2012 and January 2013, when the weather in Bangkok was relatively cooler.

Other information used by the study included temperature data provided by the Bangkok Metropolitan Administration's Department of Drainage and Sewage. Information was also collected using a household survey, which was conducted in the posttreatment period (i.e., September 2014). This survey collected socioeconomic information about the participating households alongside information about their electricity consumption behavior—for example, details of whether household members switched off electrical appliances after they had used them and about how often they washed and ironed their clothes.

Teams of enumerators and supervisors visited 161 houses in 10 housing estates; out of 161 households that participated in the field experiment, it was only possible to interview 138 households.

How households use and save electricity

With respect to the electricity-saving measures that households used, the study found that around 86% of the households that participated in the field experiment regularly monitored their electricity usage by reading their monthly electricity bills. Moreover, around 72% of households thought that electricity

Table 1. Household electricity consumption behavior (unit: households)

| Indicator | All the Time | Most of the Time | Sometimes | Never | Not Applicable |
|--|--------------|------------------|-------------|-------------|----------------|
| 1. Use washing machine when not fully loaded | 12 (9%) | 14 (10%) | 27 (20%) | 72 (52%) | 13 (9%) |
| 2. Iron clothes at peak hours | 8 (6%) | 30 (22%) | 44 (32%) | 43 (31%) | 13 (9%) |
| 3. Leave mobile phone charged overnight | 22 (16%) | 22 (16%) | 38 (28%) | 56 (41%) | 0 (0%) |
| 4. Leave the light on at night to prevent burglars | 39 (28%) | 5 (4%) | 7 (5%) | 87 (63%) | 0 (0%) |

Table 2. Percentage reduction in electricity consumption

| Treatment | Pretreatment Consumption (Unit: kWh) | Reduction in Consumption (Unit: kWh) | Percentage Reduction in Electricity Consumption (Unit: Percentage) |
|-------------|--------------------------------------|--------------------------------------|--|
| Treatment 1 | 346.48 | -21.0948 | -6.09% |
| Treatment 2 | 415.53 | -7.3213 | -1.76% |
| Treatment 3 | 480.92 | -24.8587 | -5.17%* |

Note: *, **, and *** denote statistical significance at 10%, 5% and 1%, respectively.

conservation was important to them. About half of the households had replaced light bulbs with energy-saving ones; however, the number of larger appliances that had been replaced was quite low.

Which type of information has the most impact?

The differences between the pretreatment electricity consumptions levels of the four treatment groups were dealt with using “Difference-in-Difference” analysis. This yielded results that were independent of the households’ different initial levels of consumption. In addition, the panel data regression method was also applied.

The study found that households in the third treatment group experienced a statistically significant reduction in their mean electricity consumption compared with the households in the control group. Specifically, the third treatment group experienced electricity consumption savings of around 24.86 kWh.

The study further revealed that telling people how their energy consumption compares with that of their “neighbors,” in conjunction with electricity-saving tips, reduced

a household’s energy consumption by about 6%. It was clear that when a household was informed that their electricity consumption was higher than that of their neighbors, they were motivated to reduce their electricity usage.

Policy recommendations

Overall, the study found that peer-comparison feedback can significantly influence households’ electricity consumption. This finding supports the hypothesis that the “nudge” of providing feedback to households on electricity usage does produce behavioral changes that reduce residential electricity consumption.

The study therefore suggests that government agencies should consider providing incentives to MEA and other agencies to adopt peer-comparison reporting as this can benefit both individual households and the environment. The study also suggests that there are many ways in which public or private entities might employ such feedback to drive energy-conservation behavior.

From a policy perspective, the finding that conventional energy-saving advice only had a small impact on electricity use

calls into question the economic rationale of information-only electricity conservation efforts.

Looking to the future, the study recommends for government officials to consider investing in further studies to increase knowledge in this area. Such research could be used to determine the cost effectiveness of sending peer feedback as part of a household’s regular utility bill. Future studies could also investigate the impact of giving small “rewards” for households that “beat” their neighbors in terms of their electricity consumption performance.

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