

The Effects of Better Billing Feedback on Electrical Consumption: A Preliminary Report

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Introduction

A review of Nordic energy billing in 1986 revealed that the majority of Nordic bills fail to deliver frequent, easily understandable information on consumption (Wilhite and Ribeiro 1986). In Oslo, results from a study of household energy-use behavior showed that Oslo residents were poorly informed on their energy consumption and energy costs (Wilhite 1985). A three year experiment was initiated in Oslo--and coordinated with a parallel experiment in Helsinki (Anttila et al. 1992)--to test various forms for feedback information in conjunction with billing. The experimental hypothesis is that better feedback information will lead to energy savings. We are now at the end of the experiment's second year. In this poster paper we report on results from Oslo.

The Experimental Design

Prior to the experiment's start in November of 1989, we took a random sample of 1400 Oslo households and assigned them to a control group and three experimental groups. In order to minimize observer interference, we have neither communicated or interfered with participants in any way after a letter in 1989 informing them that they were part of a study.

The control group has received Oslo Energi's (the Energy Utility servicing Oslo) normal bill for household customers, which consists of three quarterly averaged bills and a yearly summary bill. The amount on each averaged bill is approximately 1/4 of the previous year's total costs. The yearly summary bill is based on the annual meter reading. It compensates for differences between total previous amount paid in the given year and costs corresponding to actual consumption. This system is fairly common, both in the Nordic countries and in Europe.

Figure 1 shows the experimental design in Oslo. The first experimental group receives a bill for actual use every other month. The second experimental group receives the bimonthly bill, and, in the experiment's second and third years, they have received a graphic presentation comparing the current period's use to consumption in the

same period during the previous year; i.e., use in November-December 1992 can be compared to use in November-December 1991. The final experimental group receives the bimonthly billing, the graphic comparison and, in addition, energy saving tips. Figure 2 shows a portion of a sample bill for group 3.

Results After the Experiment's Second Year

The data from the end of the second year of the experiment shows several interesting results. First, the experimental groups, as a whole, used 10.4% less electricity than the control group during the experiment's second year, an increase from 7.9% in the first year. These results imply that increased billing for actual consumption has led to significant energy savings. Some of these savings may be due to the novelty of the system, but the fact that savings increased in the second year argues against this. The trend in the experiment's final year will provide more evidence on this question.

Another interesting result in light of our hypothesis is that there were no statistically significant differences among experimental groups. We must consider the possibility that neither the graphic with comparative consumption, nor the energy tips, have made a significant impact on energy-use behavior. Again, we will withhold our final judgement on this point until after the experiment's final year. To this point in the experiment, groups 2 and 3 have only received the graphic and tips for one year. It may take time for these measures to have an effect which we can register at the meter. If we represent the chain of events we expect to occur as follows:

$$a \implies b \implies c \quad (1)$$

where,

- a = new or improved information
- b = change in behavior or equipment
- c = change in registered energy consumption

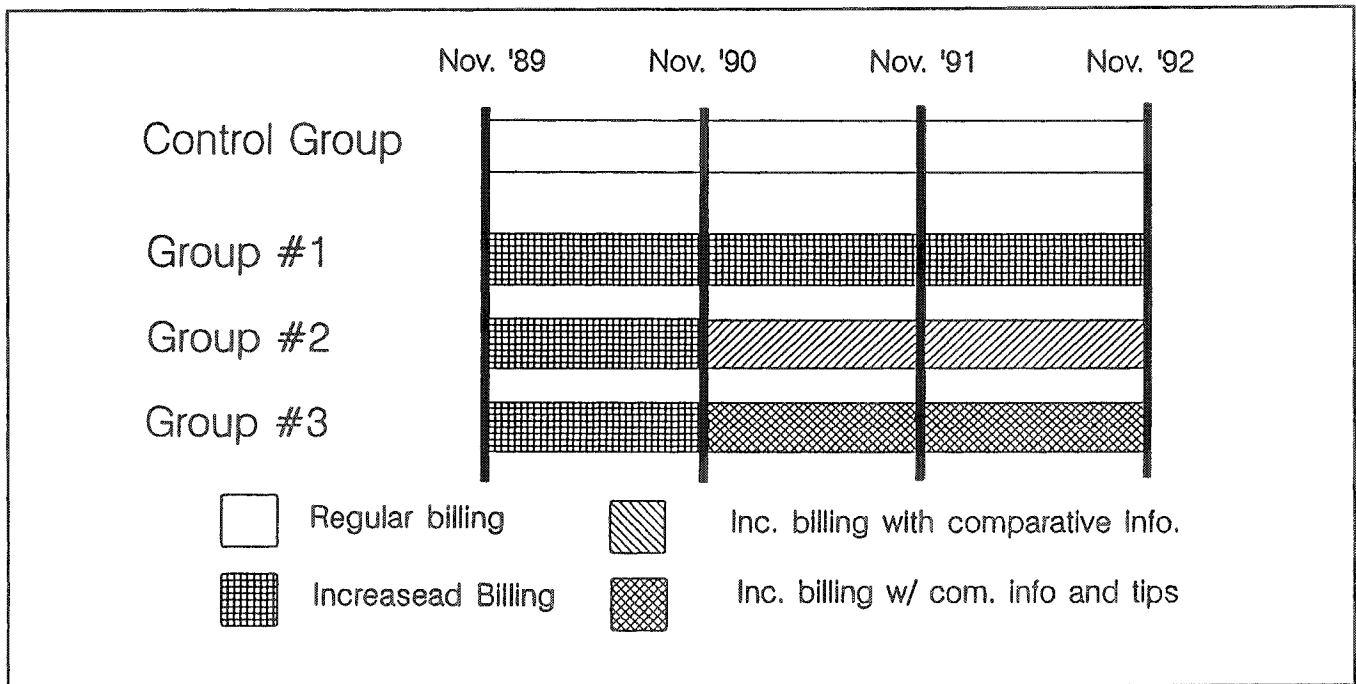


Figure 1. Oslo Billing Project: Time Table for the Experiment

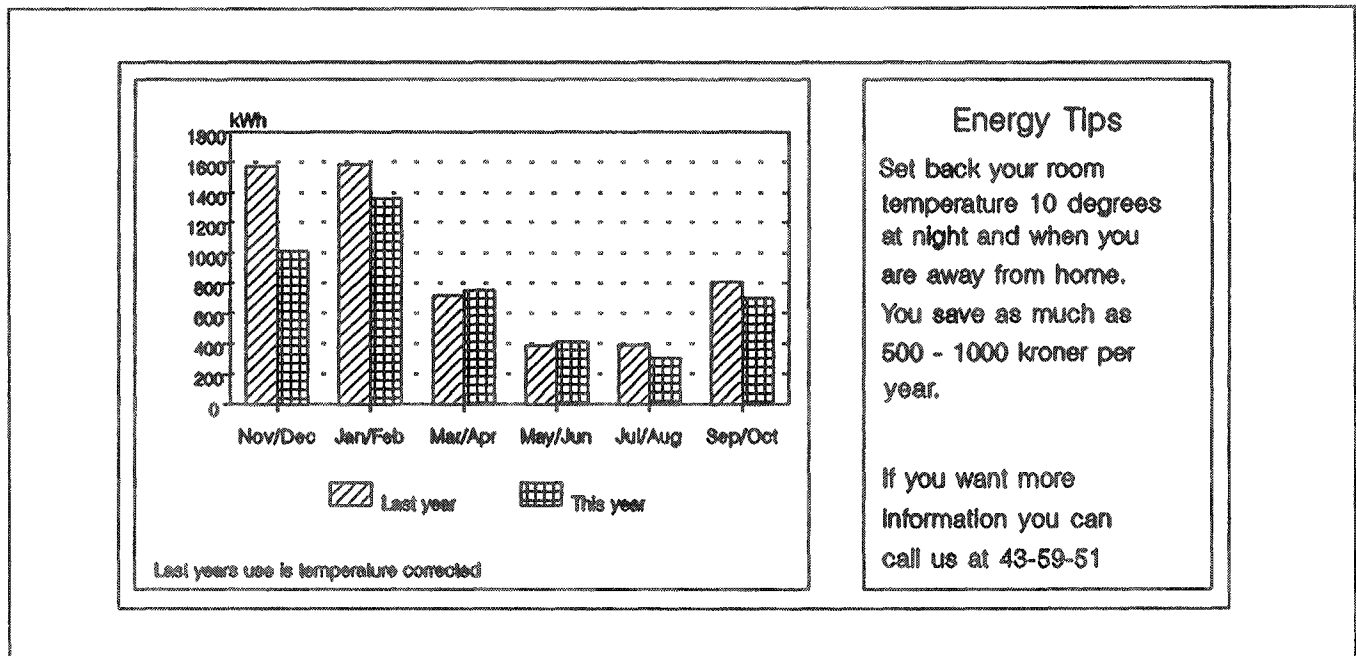


Figure 2. Comparative Feedback Information and Energy Savings Tip

There may be time lags between a and b, especially if there is an equipment purchase involved. There will also be some delay between b and c. This means that some of the changes in year 2 may not be registered until year 3.

Since the one element common to all experimental groups is the increased billing frequency, and since there are no differences among experimental groups to date, the tentative conclusion we can draw after two years is that it is the frequent billing for actual energy consumption which has stimulated the energy savings. Why? Part of the explanation may be that perhaps for the first time ever, people see more clearly the relationship between their own behavior, their energy consumption and their energy bill. As one of our participants said, "My bill made sense. For the first time, I could understand the bill. There was a connection to my consumption."

Another reason for savings may be that seasonal fluctuations in consumption have been made more visible. To check this we examined the savings in relation to the house's space heating system. Seventy-five percent of the homes in our study are heated exclusively with electricity. Households in this category saved 8.7% (difference between control and experimental groups). Households with a mixture of electrical and other heating sources--most often fuel oil, about 11% of the sample, saved a whopping 24%. Households in experimental groups with no electric heating actually used 13% more than their counterparts in the control group. Thus this latter category of household, which sees no seasonal variation, either in the amount they pay, or displayed on the graphic presentation, has saved the least, and the group which sees the seasonal variation has saved the most. In the group with multiple heating sources, some households may be switching from electricity to other fuels. In the all-electric group, the seasonal data has illustrated, perhaps for the first time, how much electricity goes to space heating. In

other words, frequent billing for actual consumption has partially disaggregated end-use for these households and has perhaps stimulated space heat conservation.

Summary

Our results to date are exciting. Using a large sample size and strict experimental controls, we have shown that improved billing techniques lead to energy savings. We will test the stability of these savings in the experiment's third and final year, which will end in December 1992.

Acknowledgements

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References

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