Billing Based on Actual Consumption, Feedback and Saving Tips as Means to Encourage Household Energy Conservation

Antti Uutela, Ulla Anttila and Anne Arvola
University of Helsinki

Introduction

In Finland, electricity utilities, like the Helsinki Energy Board, usually bill their customers on the basis of previous year's consumption average. Actual consumption and the cost of it becomes available for the consumer once a year. This obscures the association of electricity related behaviors to electricity use and to the cost of this consumption. In our experiment, consumers received bills based on actual consumption ten times a year, a normal rate of billing, with information feedback and saving tips. Through increasing awareness of energy consumption, feedback and tips may inspire the consumer to save energy and/or reduce the costs. All the extra information was provided to the subjects free of charge. The billing feedback information was optimized in the frame set by billing costs and easiness of adopting the innovation to routine billing. The experiment was made possible through the cooperation of the local Energy Board. A closely related trial is being carried out by Ressurskonsult and the Oslo Energy Board in Oslo, Norway.

Research Design

The Sample

The target sample consisted of 800 households living in detached or row houses heated with electricity and willing to participate in this study. During the years 1989-1991 attrition was 89 households, mainly because of moving to a new house. Twelve further households wanted to withdraw from the experiment, while all the others continued according to design.

The Design of the Experiment

The design involves three experimental conditions and a control group (see Figure 1). The groups were matched on family type, apartment size and house type. Year 1989 formed the baseline consumption period. Since December 1989 all three experimental groups were billed on the basis of actual electricity consumption ten times a year. In January 1991, experimental groups 2 and 3 started to receive more elaborate information on actual consumption with a graphic presentation comparing the current period's electricity use to that in the same period a year before. In addition, the third experimental group received energy saving tips, i.e., brief practical advice on how to manage the household more efficiently regarding energy use. The tips were focused on energy using habits, i.e., heating, water use, and ventilation, and also on how to save money by using the cheaper night tariff. All this information for groups 2 and 3 was provided, for practical reasons, in a separate letter.

Results

The total actual energy consumption increased from 1989 to 1991, but weather corrected figures signified a decrease in consumption. During the first experimental year, including billing based on actual consumption, all experimental groups taken together showed a consumption increase of 3.7%. In the control group the increase (5.8%) was statistically significantly higher. In 1991, when feedback information and tips were given, group 2 (with feedback) and group 3 (feedback and tips) both diminished the consumption 1.5 per cent units more than the control group. Viewing the entire two year period, 1989-1991, group 2 had saved 3.1% units, and group 3 had saved 4.9% units more than the control group.

Because of the two tariff price system households could achieve economic gain by shifting electricity use to cheaper tariff time. In 1990 or 1991, respectively, there were no significant differences in consumption shifting between the study groups. However, from the year 1989 to 1991 the experimental groups shifted their consumption statistically significantly, 0.8 - 1.4% units, more than the control group.

Discussion

Results suggest that billing based on actual consumption and feedback influence electricity use to some extent. The actual consumption billing had a lowering effect on consumption even when initially already optimal billing frequency was not changed. Dropout interviews imply that new kind of billing indeed made the customers more

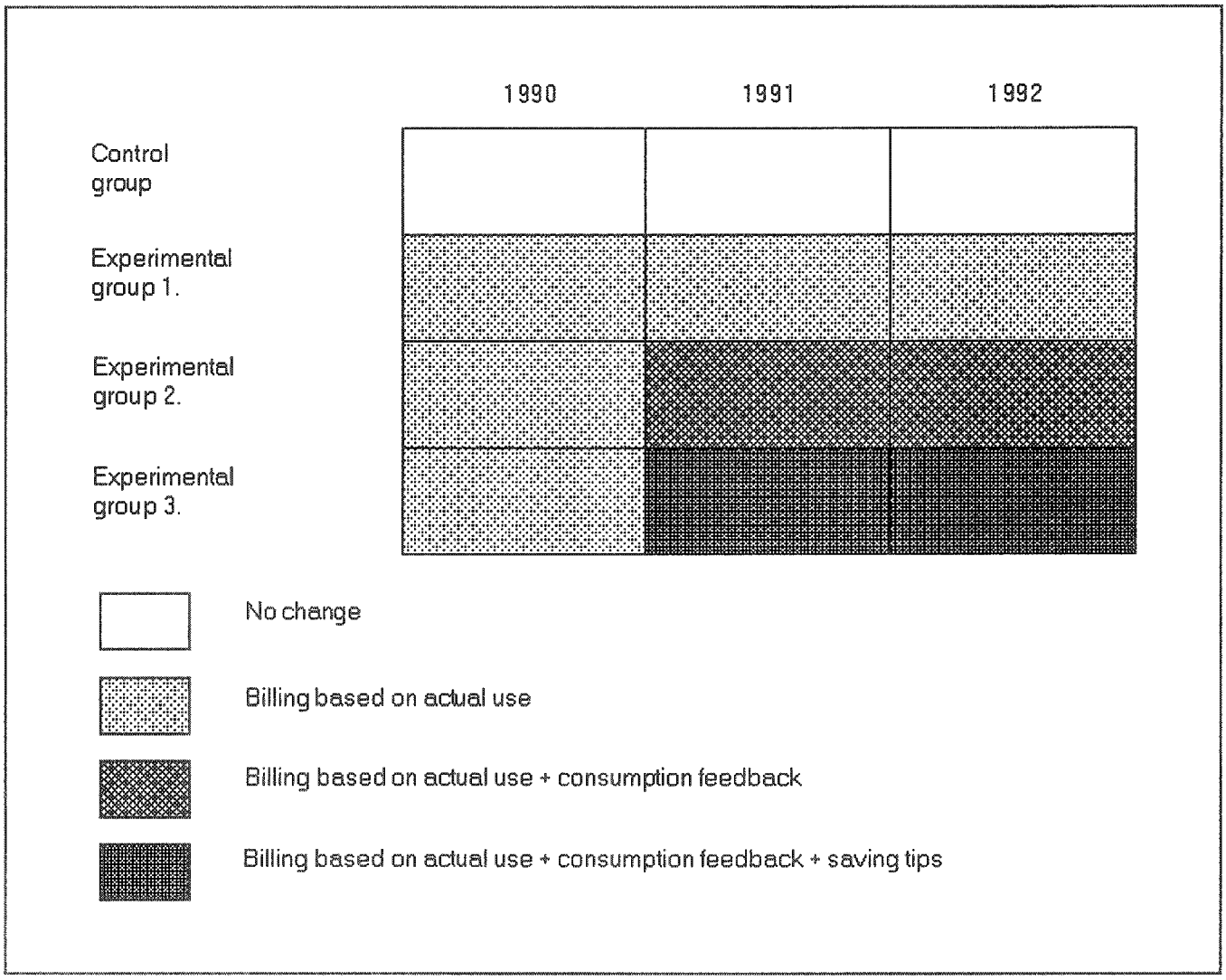

Figure 1. Design and Timetable

Table 1. Average 24 Hours Electricity Consumption (kWh), 1989-1991

	N	1989	1990	1991	Change 1989-91	Net Change 1989-1991[a]
Control grp	172	46.0	48.6	49.6	+7.9%	
Experimental grp 1	176	45.3	47.4	48.2	+6.4%	-1.5% units
Experimental grp 2	181	45.0	46.9	47.2	+4.8%	-3.1% units
Experimental grp 3	176	48.0	49.2	49.5	+3.0%	-4.9% units
Total	705	46.1	48.0	48.6		

(a) In comparison to the control group

aware of their consumption. There is no reason to suppose that billing based on actual consumption had influenced their saving skills or motives. The feedback, affecting electricity use cognitions, increased electricity savings further. However, there were no differences in savings achieved between the feedback and feedback plus tips conditions. Experimental groups also shifted their consumption slightly more to the cheaper tariff time than the control group. The savings were moderate, but the method is usable because of the saving effects and also as an improvement in service. The inclusion of feedback and tips in the routine billing of the utility - a largely administrative measure - does not cost much, nor does it need any special training to the personnel. The final field phase of this study will give us information on how much the customers themselves may be willing to pay for the feedback and saving tips that they had received free of charge during the experiment.

Acknowledgments

We are grateful for the cooperation of the Helsinki Energy Board, which made this study possible. Mr. Juha Rantanen, Mr. Kalevi Havukainen and Mr. Jukka Niemi from the Energy Board deserve special thanks. We also thank Mr. Harold Wilhite and Dr. Richard Ling from Ressurskonsult in Oslo, Norway for the cooperation and scientific inspiration.