LESSONS LEARNED ABOUT INCENTIVE METHODS TESTED FOR RESIDENTIAL LIGHTING EFFICIENCY PROGRAMS IN SWEDEN

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Abstract

This is an evaluation of four incentive methods for residential lighting efficiency programs initiated by the National Energy Administration (NEA) in Sweden. The penetration in the four regions was: 0.026 (shared rebates between customers and stores), 0.04 (rebates on electricity bill), 0.052 and 0.056 (cash rebates to customers) with an average of 0.045 redeemed coupons/eligible household. Lamp shortages were a large problem, which could explain why penetration and variation among regions was not higher. Thus, there was no clear indication which incentive method is better.

According to the program survey--which included interviews with 1000 households-almost all households remembered seeing the information folder, and the message to save energy was well understood. Forty percent of the participants were retired and 65% lived in single-family or row houses. Participants felt that the main advantages with CFLs are energy savings and long lamp life. The main disadvantage is high lamp prices. Over 70% of those interviewed say they will buy CFLs in the future, but the high price still seems to dissuade most people from buying CFLs.

Retailers are mostly positive about the programs, but late notification of the programs gave them trouble ordering lamps in time. Retailers also seem to have greatly underestimated the demand for CFLs. For the utilities, the programs were a method of promoting and familiarizing their customers with CFLs and for improving customer relations.

INTRODUCTION

To replace incandescent lamps with compact fluorescent lamps (CFLs) is a good example of practical conservation of electricity. CFLs provide other benefits as well, but convincing households to switch from regular incandescents to lamps that are ten to twenty times more expensive is a formidable task. It requires good cooperation and an extensive exchange of information between lamp manufacturers, utilities, retailers, and households.

The National Energy Administration of Sweden (NEA)* developed together with Ervaco (an advertising/marketing consultant) five different methods for promoting CFLs as well as luminaires and tested four of the methods in November of 1990. NEA's engagement is noteworthy since this is probably the first government-operated program that has been conducted in Europe. The households' reactions to the programs were followed up in a survey by SIFO Market Research[1] including interviews with 1000 households.

The purpose of the programs was to find the best incentive method to spread energy-efficient lighting to residential customers. Many incentive programs for CFLs have been run throughout Europe and some of these have compared different incentive methods[2]. This is however the first Swedish comparison and also the most systematic comparison of incentive methods done in Europe. It is also among the first programs to promote specialized CFL luminaires, which forces customers to use energy-efficient lights; otherwise, CFLs could be replaced with incandescents when they need replacement.

* Now incorporated in the Swedish National Board for Industrial and Technical Development (NUTEK).

The interest for energy-efficient lighting shown among lamp manufacturers, retailers and utilities is important to foster. The programs followed up a similar public information and rebate campaign by lighting manufacturers in Stockholm and Gothenburg in October, 1990.

INCENTIVE METHODS AND MATERIALS

Described below are the five different incentive methods conceived for the project. Each method offered customers a sheet of rebate coupons good for 9 lamp types and 5 luminaires.

Method 1: Low Cash Rebate
The customer left the rebate coupon in the store and received a cash rebate at the time of purchase. The lamp manufacturers paid for rebates that varied between ECU 2.6-3.9 for lamps and ECU 3.9-26 for luminaires*. The stores were paid by the Swedish Coupon Clearing House.

Method 2: High Cash Rebate
Method 2 was similar to method 1, but the rebate levels were twice as high. The manufacturers and the utility paid for rebates that varied between ECU 5.2-7.8 for lampsand ECU 7.8-26 for luminaires. The stores were paid by the Swedish Coupon Clearing House.

Method 3: Shared Cash Rebate
This method was similar to method 1, but the store also received a rebate for each lamp sold. Rebates to customers varied between ECU 1.95-2.6 for lamps and ECU 2.6-18.2 for luminaires. The rebate to the retailers varied between ECU 0.65-1.95. The rebates were paid by the manufacturers and the stores were paid by the Swedish Coupon Clearing House.

Method 4: Rebate-on-bill
The customers bought the lamps at full price. The rebate coupon was sent to the utility together with a receipt of the purchase and was later subtracted from the subsequent electricity bill. Rebates varied between ECU 2.6-3.9 for lamps and ECU 3.9-26 for luminaires, that are the same rebates as for method 1.

Incentive methods 1, 2 and 4 where conducted by utilities that serve urban areas, whereas method 3 was tried by a utility that serves a sparsely populated area.

Method 5: Pay-on-bill
This method was never tested.

Households would have received coupons marked with the households customer number. The customers would have picked out any of the 14 offered products. Coupons would be left with the retailers who would have sent the coupons to the utility. No rebate would have been offered. Customers would have paid the full price of the lamp on their subsequent electricity bill.

The utility anticipated billing problems associated with identifying and matching customers to the coupons they would receive from the retailers. There were also concerns about financial risks with unpaid utility bills and the risk of rebate coupon abuse. Similar programs have been run successfully throughout the Netherlands and in several Danish utilities[3], and one is now under way in Uppsala, Sweden. It would be interesting to investigate how they avoided these problems.

Information and Promotional Materials
Each utility sent out an information letter to the concerned retailers, twelve weeks before the coming program. Technical information about low-energy lamps was provided in order to prepare sales personnel for customer questions. Two weeks before the program started, signs in two sizes were sent out together with technical data and product descriptions.

The customers recieved an information folder which described the different lamp types and gave suggestions as to where to use them. Inside the folder was a letter from the utility and the sheet of rebate coupons which could be redeemed in any store.

The programs were promoted by local newspaper advertisments. They were also covered in local radio and regional TV programs as well as by a large number of local newspapers.

* The exchange rate prevailing on January 31, 1990 (ECU 1 = SEK 7.692) is used throughout this paper.

PROGRAM RESULTS AND DISCUSSION

Program Penetration

The four utilities offered rebate coupons to a total of 106 000 residential customers. Results of each program are listed in Table 1.

Table 1: Program description and penetration

Utility	Method number	Eligible households	Coupons redeemed due to program		Penetration (Redeemed coupons per 100 eligible HH)
			Lamps	Luminaires	
Karlstad	1	31 850	1559	89	5.2
Halmstad	2	28 825	1555	61	5.6
Stora Kraft	3	20 125	506	23	2.6
Nyköping	4	25 150	978	32	4.0
Total or average		105 950	4 600	205	4.5

During the programs a total of 4 800 coupons for lamps and luminaires were redeemed. From an international perspective the average penetration of 0.045 redeemed coupons/eligible household is comparatively low, and the differences between the four regions are only marginal. Several large programs have been run by Stockholm Energi, and they received penetrations of 0.20 lamps/eligible household (1988), 0.13 lamps/eligible household (1989) and 0.05 lamps/eligible household (also 1989). The average penetration for 42 incentive programs conducted throughout Europe was 0.35 lamps/eligible household[4]. In the most recent Stockholm and Gothenburg programs (Oct, 1990), penetrations of 0.06 and 0.04 were recieved respectively[5]. These programs were similar to the programs described here, and the same sheet of rebate coupons were used.

Of the 4 600 coupons redeemed for lamps, over 70% of the lamps sold were lamps with electronic ballasts. Only about 200 coupons for luminaires were redeemed. Finding specific luminaires is more difficult than finding CFLs because fewer retailers carry them. Therefore, a program using rebate coupons needs to assure that these lamps are available to customers in order for the program to be effective. However, there might be more effective methods to increase purchases of energy-efficient luminaires.

The purpose of the programs was to evaluate different incentive methods. One indicator of the result could be the penetration. However, because of problems with lamp shortages in the regions, this must be done with some caution. In all four regions retailers ran out of lamps before the end of the programs, which was certainly the largest problem with the program. The Ervaco program evaluation concluded that the rebate levels given in Karlstad were sufficient to attract the customers. It further stated that the higher rebate levels given in Halmstad could not be recommended in the future as it did not lead to a markedly higher penetration[6]. These conclusions cannot however be drawn. First, the penetration difference between the four regions are smaller than the margins of error. Second, because of the lamp shortages it is impossible to tell what the outcome would have been if there would have been enough lamps.

Unfortunately, the program evaluation did not determine the percent of eligible households that actually participated. An upper limit of participation is 4.5% assuming that each household bought only one lamp. A more realistic guess is that participating households on average bought more than one lamp which reduces the penetration. Assuming that households on average bought two lamps gives a penetration of 2%, and if 4 lamps per household were bought only 1% of the eligible households participated. In the survey (partly carried out *during* the program) households where asked if they had or where planning to participate in the program. Of those in a randomly selected group of households who had noticed the programs, 23% on average said they had or would participate. The survey gave no indication about why so many said they would participate but obviously never did. Neither did the answers given in the four regions differ enough to be statistically significant. No conclusions can therefore be drawn, given the survey nor the outcome of the test, as to which incentive method is better.

Problems

As mentioned above, the largest problem with the programs was that retailers ran out of lamps before the end of the programs. It seems that even stores that tried to fill up their stocks before the program greatly underestimated the demand for lamps. In some cases, stores ran out of lamps after one or two days. The lamps were back-ordered, but after one or two weeks the manufacturers and wholesalers also ran out of lamps, especially the electronic types which were the most popular. The few lamps they could deliver had to be divided between the different

retail outlets. When the ordinary manufacturer or wholesaler could not deliver lamps, some stores turned to other wholesalers that sometimes could get lamps from different parts of the country. There was however never a shortage of luminaires, but these were not nearly as popular.

The lamp shortages led to customer frustration. Some customers did not want to wait and get their lamp later, while other customers paid for their lamp in advance (while the coupons where still valid) sometimes having to wait a long time before a new delivery arrived at the store.

The lamp shortages were due to market and information failures. One essential ingredient of successful lighting programs is that there exist coordination between the lighting industry and groups promoting the use of efficient lighting products. This coordination is necessary to ensure that supply meets demand[7].

One consideration with new products is that traditional forecasting models cannot be used. It is not surprising that lamp manufacturers have difficulties reading the market especially when there are new third-party forces acting within the market (as, for example, when utilities promote the products). Forecasts of CFL sales must be based on the current market and future utility plans. In this case, the Stockholm and Gothenburg programs performed the month before the NEA programs drained the market of lamps to such an extent that lamp shortages occured in stores involved in these programs as well[8,9]. Delaying the NEA programs until the market could be restocked probably would have increased penetration.

Participant Reactions

Despite inconclusive information on participation, a substantial amount can be learned from the program survey. The reactions from the public and the participants were studied by SIFO Market Research. The target group was all households in the four regions that were covered by the program. The interviews were carried out in two steps:

Group 1: 800 randomly selected households in the four regions were interviewed. The person in the household responsible for paying the electricity bill was interviewed.

Group 2: 200 specifically selected participants were interviewed.

The results from the interviews are shown below. Note: Statistics for non-participants come entirely from group 1. Statistics for participants come from both groups 1 and 2.

A participant was typically retired (38%) and lived in a single-family house (50%) or row house (15%). A non-participant was often working without children (37%) and lived in a flat (53%), Table 2.

Table 2: What does a participant and a non-participant look like?

	participants	non-participants
- retired	38%	27%
- working with children	31%	34%
- working without children	31%	37%
- apartment	35%	53%
- row house	15%	10%
- single-family house	48%	32%
- farm/other	2%	4%

The lighting program was noticed by 82% of the randomly selected interview subjects. Of those who had noticed the program, 78% remembered having seen the information folder in the mail. Many had also read advertisements and articles about the program in the local press, and some had seen the advertisements in the stores.

Of those randomly selected, three out of four (76%) remembered and could identify the information folder (spontaneously or with some help). In comparison to other direct mailings, this is a very good result. According to SIFO, direct mail is on average noticed by 41% and the highest score (85%) is received by the IKEA-catalogue! Of those who had seen the information folder, 51% could correctly identify the sender (the utility), 39% were uncertain or could not identify the sender, and 10% gave a wrong answer.

Almost everyone interviewed understood the message of the program, less than 8% could not give a correct answer. Among participants "saving energy" was considered to be the main message in the program and 40% thought it was a "very important" message. Among non-participants only 26% thought the message was "very important".

The most frequently mentioned advantages of CFLs, both by participants and non-participants were that the lamps save energy and last longer, Table 3. The main disadvantages mentioned were high lamp prices and that the size/weight was unacceptable, Table 4.

Table 3: Advantages of CFLs. Question: "Which do you consider to be the advantages of CFLs?"

	participants	non-participants
- energy saving	81%	24%
- durability	45%	24%
- the lamps do not get hot	11%	5%
- pleasant light	12%	5%
- uncertain	4%	22%

Table 4: Disadvantages of CFLs. Question: "Which do you consider to be the disadvantages of CFLs?"

	participants	non-participants
- too expensive/not profitable	49%	41%
- do not fit in existing luminaires	26%	9%
- too heavy	22%	7%
- do not like the light	4%	3%
- loosing heat from lamp	3%	3%
- starts too slow	5%	1%
- no disadvantages/uncertain	17%	43%

It should be noted that the high price is more often mentioned as a disadvantage by participants, but this group also know how much the lamps cost. Obviously, the responses above show that participants are much more knowledgeable about CFLs than non-participants are. It is possible that increased awareness would translate into increased purchases of CFLs, and/or participation in future lighting-efficiency programs.

The main reasons for participating in the programs were: to save energy, convenience (do not need to replace the lamps as often), interested in trying a new technology, or simply to use the rebate coupons, see Table 5.

Table 5: Reasons for participating in the programs. Question: "What was the main reason that you bought or plan to buy a CFL?"

- lower energy use/cost	77%
- durability/do not need to change as often	31%
- like to try a new technology	13%
- like to use the rebate coupon/good offer	13%
- good for the economy of society/environment	6%
- pleasant light	11%
- produce less heat	8%
- other	7%
- uncertain	0%

The reasons for not participating, except for pure "laziness", were mainly that the lamps are too expensive, Table 6.

Table 6: Reasons for not participating in the programs. Question: "Why didn't you use the rebate coupons for CFLs in your household?"

- passivity/did not get around to it/do not know where the coupons are	31%
- too expensive	18%
- not interested	9%
- use/cheaper with incandescents	10%
- do not think it is profitable	5%
- have CFL already	2%
- too big/heavy/bulky	2%
- other	24%
- uncertain/no answer	12%

Everyone interviewed was asked about the maximum price they are willing to pay for a CFL. The answers are represented in Figure 1. The maximum price curve falls dramatically in both groups although participants are more willing to pay a higher price. But there is a large group among non-participants that are uncertain (46%) and can not give a maximum price.

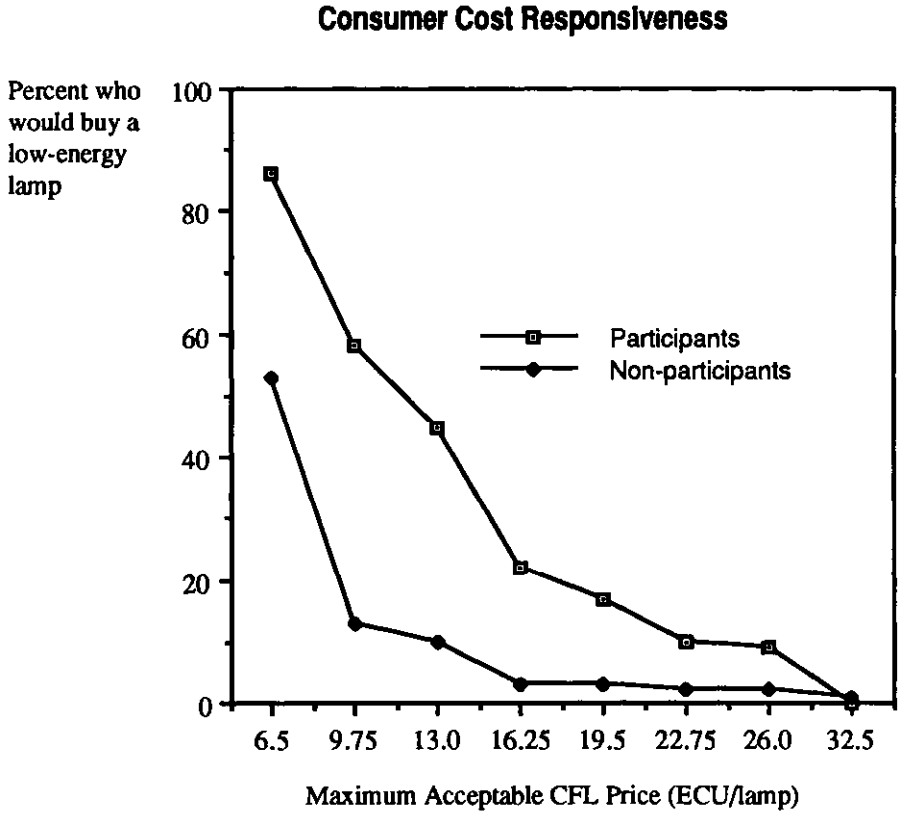

Figure 1: Cost response curves for participants and non-participants.

Every sixth household uses at least one CFL today, and every tenth household uses more than one. All those interviewed were asked if they will buy a CFL in the future. The answer is interesting. 80% of the participants say they will buy more, and almost as many non-participants (68%) say they will buy CFLs in the future!
When it comes to knowledge about the lamps there is a lot of confusion and uncertainties. As many as 90% do not know what the difference is between lamps with mechanical and electronical ballast. It was obvious from open responses given in the survey that people often mixed the two types up:

- Electronical lamps start slower, they blink a little.
- A mechanical lamp you turn on yourself, an electronical lamp is triggered by light.
- You should not turn the electronical lamp on and off too often, it is better to have it burning all night.
- Electronical lamps turn on and off by themselves.

Retailers' Reactions
Retailers have for the most part been very positive about the programs. Even if CFLs have been available for ten years, the public has not been aware of their existence. The programs thus played a role in educating the public about the lamps and their ability to save energy. Many stores claim that the sales of CFLs to the residential sector before the program had been very small, if any. But during the programs sales increased dramatically. After the programs many stores notice a higher interest for CFLs from the public than before but almost as many say that sales are back to a normal low.

Some retailers were not completely happy about the programs, as can be seen of some of the reactions that are listed below.

- Information came too late. We would like to be informed 6 months in advance to be able to order lamps in time.
- A very good program. The rebate greatly increased our sales.

- It was the wrong time of the year. In November and December we always have lots of customers in the stores and don't have time to answer all questions. Most of those who came with rebate coupons where over 60 and had lots of questions and plenty of time.
- There was a crisis when the lamps ran out. Especially as demand increased vigorously during the last days of the program when we had nothing to sell. A large quantity of lamps are back-ordered, but many customers got angry and did not want to order lamps for later delivery.
- The utility gave us good support, but we didn't hear from the wholesalers. And when we called them, they didn't even know the program existed!
- Of course we appreciate getting part of the rebate. It increases our interest.
- We would have liked the duration of the program to be longer. One month is not enough for everyone to notice the program.
- The regular price of the lamps should have been printed on the coupons. When the customers learned about the price they were shocked and went home. But many thought it over and came back to buy a lamp.
- Stores should get more information about the lamps than just the printed matter. The manufacturer used to visit us before, but this service is now gone. We are probably too small.
- It turned out that all our customers did not receive the rebate coupons. Therefore we lowered the price during the program. But the coupon turned out to be psychologically important.
- The customers were mainly older people. They appreciate the longer lifetime of the lamp because they think it is difficult to climb on ladders and chairs when they replace a lamp.

One possible future problem could concern the reactions of intermediaries (distributors, wholesalers, etc) to fluctuations in their market share. However, in the longer run the programs help seed the market, which benefits all traditional actors in the market.

Utility reactions

The utilities have for the most part been very pleased with the programs. They got a positive response from both customers and stores and made many new contacts with customers. Some of the customer reactions were negative--"this is nothing that you should do"--but most customers called asking serious questions about the lamps and their profitability.

Some of the complaints where that the information folders came late which created extra costs for sending them out in time. Internal information failed in one case, the receptionists did not know whom the customers should talk to. Furthermore, a lot of people called the utilities wondering where to buy the lamps. They misunderstood the information folder and thought the utilities had a store selling the lamps. The most serious complaint against the program is that there were not enough lamps available to meet the demand. The program convinced a large number of customers to buy CFLs, but this achievement had little value when there where no lamps to buy.

The efforts made by the utilities varied, both concerning time and money spent. A rough average for the different programs is shown in Table 7. (Note: these costs do not include costs for designing the promotional material and evaluation).

Table 7: Average costs and time spent by the utilities in association with the programs.

Direct mail (coupons, information folder, letter)	ECU 0.65/customer
Distribution and postage	ECU 0.26/customer
Information to retailers	ECU 1.3/store
Signs (5 per store)	ECU 65/store
Advertisements	ECU 3250-6500
Time spent by utility	200-400 person-hours

WHAT NEA INTENDS TO DO WITH THE RESULT

The results of the program are being spread to utilities, as well as to manufacturers of both lamps and luminaires and their organisations. This is done through direct mail, seminars and other meetings. It is also spread through articles in the trade press.

NEA's next step is to support a program, in which the customers pay for their lamps through their utility bills. The first stage of the program is intended for residential customers. Later it might be expanded to include commercial customers. As currently planned, the utilities will charge for the efficient lighting equipment over a period of two years and six bills[10]. Uppsala Energi is currently doing a pilot test sponsored by NEA.

CONCLUSIONS AND RECOMMENDATIONS

This test gave, unfortunately, no indication as to which incentive method best inspires people to buy energy-efficient lighting. Another comparative test of incentive methods would therefore be recommended. It would be interesting to conduct programs that have longer running times and a wider variation of incentive levels. Another idea might be to use mail order, which could help reach customers in sparsely populated areas. However, for future programs to be successful it is essential that there be good coordination between the lighting industry and groups promoting the use of efficient lighting products.

A lesson learned for the design of future programs is to pay attention to details such as:

- Ensure that information reaches all the retailers. Address lists need to be checked.
- Establish personal contact with the retailers. Visiting or calling them are ways of making them aware of the coming program. Otherwise they might not take notice of important information, especially if it comes from an unusual source like the utility.
- Make written information easy to read (both to customers and stores).
- Educate sales personnel, since they are often unfamiliar with this new technology.
- Send an estimate of potential light sales to retailers. This is especially important for a first-time lighting program.
- Ensure widespread internal awareness within the utility. For example, it is important for receptionists to correctly direct customer and retailer calls.

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