Conservation agreements with households: DSM taken a step further

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1. SYNOPSIS

In this paper we outline a conservation agreement system for households. Our outline addresses the issues of specific conservation targets and commitment to energy saving.

2. ABSTRACT

On a general level, energy conservation efforts are motivated by environmental concerns and more specifically, internationally agreed goals concerning reduction of emissions, most importantly CO2. On a concrete level, energy saving can be motivated by collective welfare interests or by individual utility seeking. In some countries energy prices are not high enough to constitute effective private incentives. Attitudes are generally positive towards protecting the environment, so that the collective motive could be pursued.

However, if it is unclear how large the conservation task is, what one's individual share in it is, and whether the others are doing their share, it is difficult to maintain a sense of collective effort.

We outline an agreement system for the household sector that addresses these issues. We combine elements from two existing practices, i.e. energy conservation agreements in the industrial sector and DSM with households, chosen because of the relatively important role of commitment in them, compared with more open-ended conservation campaigns.

The first step is to define concrete goals. Political decisions on overall conservation targets are needed. General targets are translated into average household electricity and heating consumption figures. A finer level of target values can be calculated, based on information on the variation in consumption due to technical, demographic and other differences.

The next step is to ensure commitment. Energy companies would offer their customers energy deals based on the target values. The customers would then get help in improving their energy efficiency.

Finally, problems inherent in this suggestion are discussed.

3. INTRODUCTION

Energy conservation efforts are motivated by environmental concerns in general and, more specifically, by internationally agreed goals concerning reductions of emissions, most importantly CO2. These goals are quantitative in an absolute sense, i.e. no more than a specified quantity of CO2 should be emitted annually.

The conservation potential available for households and industries alike is more relative in character. For example, the energy conservation program of the Finnish government (1992) set the conservation goals in terms of specific rates of energy consumption. Specific consumption rates of various activities can be reduced, sometimes dramatically, with the aid of technical improvements or behavioral changes, but as entire consumption, production and activity patterns change, there is no inherent guarantee that overall energy consumption (and thereby CO2 emissions) will diminish. In fact, during the last decades the total energy consumption has been increasing despite the decrease in specific consumption (Schipper et al. 1993).

Energy saving can be motivated either by collective welfare interests or by individual utility seeking (Uusitalo 1991). The preservation of the environment is a typical collective interest. While attitudes towards environmental protection are generally positive, it is not yet clear to everybody what role energy conservation plays in this context. Besides, attitudes do not directly translate into action. Even for people who understand the energy-environment context, it may be difficult to be motivated to conserve.

So far, attempts to influence energy consumption have been based on economic, normative and informational instruments. In the case of energy use one of the most important individual motivators is evidently money. By economic theory, economic instruments (given certain assumptions) would be the most efficient, resulting in optimal decisions. It may not, however, be politically possible to raise e.g. energy or emission taxes to levels that would result in enough energy conservation.

Apart from private economic incentives, the decisions for changing energy use behavior often depend on people's willingness to promote the collective good. Reasons for not acting according to one's attitudes in favor of collective good are partly related to the dilemma between individual and collective rationality (Uusitalo 1991). E.g. by acting rationally from their individual point of view people are producing environmental damage as an unintentional side-effect, which means that at the same time they are acting irrationally, viz. contrary to their own preferences for a clean environment.

The strategic situation where the individual should choose whether to contribute with his/her own effort to the production of collective good, or whether to defect and look for his/her own self-interest, is described in game-theory as a prisoner's dilemma. In its simplest form, the player A can achieve highest utility by making a selfish choice, in case B acts co-operatively. In this case A is a free-rider, and B suffers the losses. Mutual co-operation would be the second best alternative, and to mutual advantage. But the co-operative player takes the risk that the other one will not co-operate. The worst alternative would be both making the defective choice; it implies less utility for both since the collective good is not produced at all. In a case where no collective social norms or information about the choices of other people is available, defection is the dominant strategy for most people. (See e.g. Axelrod 1984, Pettit 1986, Uusitalo 1990.)

Various studies about human behavior in general and environmentally friendly behavior in particular have been able to point out factors which decrease the probability to act according to the collective interest (Uusitalo 1990, 1991, Van Raaij & Verhallen 1983, Kliemt 1986). Some of these are relevant in this context: worries about other people not doing their share (free riders), the perceived small impact of one's own actions, and uncertainty about whether one is doing enough. In addition, the commitment to a goal (of e.g. energy saving) and the acceptance of personal responsibility are important mediators between attitudes and behavior. These factors have not been sufficiently taken into consideration in saving measures.

Information about conservation potential and measures and feedback about consumption are essential in combination with other instruments (Nielsen 1993) and can be effective even alone (Arvola et al. 1993, Wilhite et al. 1993). These can also increase the perceived possibilities for saving (Arvola 1994). Alone, knowledge about possibilities does not necessarily lead to action.

Legal norms may not be efficient according to economic theory but are already widely used in e.g. buildings and traffic, and might be a good way to cut some energy "waste".

In general, ordinary means of conservation promotion do not address the problems mentioned above. Indeed, it is difficult to find socially acceptable short-term measures which would increase the saving motivation considerably, since most of the problems are embedded in the structures of our society.

The dilemma between individual utility seeking and collective welfare is a structural characteristic of our society. In an atomistic, competitive society, where individual utility is emphasized more than collective goals, and where the social norms are weak, it is easy to forget the collective goals if they do not also produce private benefits (Uusitalo 1991). In addition, there is often uncertainty about the collective goals, which can also be contradictory. The diffusion of responsibility to different levels of society contributes to the difficulty of seeing the possibilities for action or adopting personal responsibility, along with the invisibility and remoteness of the problem itself (e.g. the environmental pollution), the invisibility of consumption and of the consequences of one's behavior.

In situations like this, where the objective standards for evaluation of one's own behavior are insufficient, socially comparative information becomes more important (Festinger 1954). We know from previous studies (e.g. Melasniemi-Uutela 1994, Mustonen 1994), that consumers want information on where they stand compared with others in terms of energy consumption.

In summary, for conservation efforts to get going, many things are needed. Positive attitudes, technical potential, knowledge and incentives are all factors that are often discussed in the literature. But we believe that apart from these things, factors mediating the connection between the positive attitudes and the concrete action is needed. By making better use of such factors as the economic motivation for saving, the perceived possibilities for influencing the total

energy consumption, and the information about contribution of other consumers in conservation efforts, the commitment to energy saving can be increased and the saving results thereby improved.

The purpose of this paper is to outline an agreement system for the household sector that would address these issues, and thus strengthen the impact of both collective and individual motives and alleviate the conflict between them, as well as focusing on quantitative savings rather than specific energy consumption. We combine elements from two existing practices, i.e. energy conservation agreements in the industrial sector and DSM with households. We have chosen these two groups of practices because of the relatively important role of commitment in them, compared with more open-ended campaigns to encourage energy conservation. The problems related to the applicability of the outlined system are identified and pointed out as topics of further research and discussion.

4. CONSERVATION AGREEMENTS BETWEEN THE GOVERNMENT AND INDUSTRY

High prices are a natural incentive for energy efficiency in industry. Industrial organizations do not favor energy taxes, however, since they are worried about the consequences for the competitive position of industry, in case a tax is not applied on a world scale. Voluntary agreements are seen as a way to increase the industry's commitment to energy conservation.

According to the Union of Industrial and Employer's Confederations of Europe, voluntary agreements to conserve energy have the advantage over command and control or economic and financial instruments companies can take their own decisions on how to reach the agreed targets, and new taxes are avoided. Conservation measures can be synchronized with the normal production and investment pattern of the company. The disadvantage are that the legal status of voluntary agreements is not always very clear, and there is also the problem of free riders.

Important aspects of voluntary agreements are:

- the type and specificity of the goal
- clarification of the legal status
- preventing the problem of free riders (a strong branch organization is important)
- monitoring the results (sometimes using an intermediate organization to report on the effectiveness of the voluntary initiative, for reasons of confidentiality)
- setting escape clauses for unforseen external developments (economic or political).

To achieve the goals set in the energy conservation program of the Finnish Government in 1992, the Ministry of Trade and Industry and the central organizations representing industry made an agreement on energy conservation. The goals of the agreement are set as decreases in the specific consumption of energy in both heat and electricity. This is the same approach as that in the government's program. The organizations of industry will, according to the agreement text:

- promote the search for and implementation of energy conservation activities and the development of less energy intensive products and processes,
- influence the companies to record their energy consumption, make annual energy balance and record the development of specific energy consumption,
- participate in activities aimed at the development and adoption of energy analyses,
- promote information activities for companies
- promote energy education in companies and organize educational activities.

The ministry will

- try to increase financing of energy conservation research, development, information and education activities
- participate in financing demonstration activities
- promote and finance energy analysis
- participate in the financing of energy conservation campaigns within the industry.

There is a steering committee representing both parties and eventually other experts.

So far one of the major tasks in preparing to carry out this agreement has been to decide upon the ways in which specific energy consumption is defined and measured, since this was not done as a preparation for the agreement. This has now been done for the forest industry and is under way in the metal industry.

The content of the agreement is rather loose, in that the general aspects cited above (legal status to escape clauses) do not really apply.

There are examples of work on agreements in other European countries. In The Netherlands, the first step is a declaration of intent signed between the Ministry and an industry branch, after which an inventory is made to define the issues to be agreed upon. This is probably comparable to the Finnish agreement. The second step is the signing of the voluntary agreement itself, in which not only the specific saving goals but also the procedures to achieve the savings as well as the monitoring of the progress are agreed upon.

An important partner in this process is NOVEM, a private organization which acts as an intermediary between the Ministry and the individual company. Its task is:

- to give expert advise to companies on energy saving possibilities for their specific situation
- to present annual reports to the Ministry on the results achieved with the voluntary agreements, based on individual and confidential reports from companies.

Because of the joint inventory work of NOVEM and each industry, final goals of agreement are made specific and realistic. Experiences so far have been very positive. The central role of NOVEM, however, makes the procedure quite costly.

In Germany it has until recently (Feb 1994) been impossible to negotiate similar agreements, partly because the government was not willing to accept voluntary instruments as an alternative to fiscal and regulatory instruments, and partly because of the effects of the recession. However, interest in the issue is still alive.

In the UK, as a part of a voluntary action, companies publish corporate policies setting standards and objectives, and define responsibilities within the company. The main criticism is that there is no formal public reporting and thus no way to ensure that companies are undertaking their commitment.

In summary, energy conservation agreements between industry and governments are attempts to combine the public and the private interest. It is in the interest of the industry to make agreements in order to be able to choose the most economical means of pursuing the common goals. While the problem of free riders cannot be excluded, it is possible to make agreements which cover most of the industry, and design ways to measure their progress.

More important, there is an explicit commitment to a goal and an idea of what each participant should be responsible for. Feedback information on progress is important; if it is missing, the system loses its meaning. Developing a measuring system can become a major issue worth tackling, as in Finland.
An important motivating factor behind the agreements is an awareness of strong pressure towards environmentally friendlier practices, be it from the political sphere or from the market.

5. DEMAND SIDE MANAGEMENT FOR HOUSEHOLDS AND WAYS TO PROMOTE ENERGY SAVINGS

5.1 Demand side management

The initiation of demand side management activities dates back to the 1970s when quadrupling oil prices forced utilities and customers to economize with energy in some regions of the US. Not only was conservation well motivated, it was also easy and cost-effective in a country that had become used to abundant, cheap energy - opportunities for painless conservation were enormous. Conversely, the downturn in energy prices, beginning in 1981, reduced both the urgency and the cost-effectiveness of conservation and load management programs (Shioshansi 1994).

Another concrete motivation for DSM often comes in the context of problems with existing or planned power production capacity, eg. decisions to discontinue the use of a nuclear plant, as in Sacramento (Eto and Goldman 1993), or unwillingness to build new large nuclear or coal plants. The DSM effort can focus on either conservation or load management, depending on whether the problem lies with the fuel supply or power production capacity.

Even without immediate crisis situations, DSM is now encouraged or mandated as a part of more general Integrated Resource Planning (IRP), which is now compulsory in many states in the US (Shioshansi 1994, Eto & Goldman 1993). By managing demand where possible and economically reasonable, rather than providing supply to match, economic profits and environmental gains can be achieved DSM is indeed "politically correct" for environmental reasons and because many supply options are so unpopular.

Good as the environmental motive is, it is not as pressing as an acute oil shortage or a capacity shortage. The immediacy and need for commitment may be lacking, from the point of view of the utility as well as the customer. Eto and Goldman (1993) actually point out that, typically, an initiating event is required for DSM to work; either external to the utility (such as a form of government intervention) or internal (such as a large impending resource need), or often, both. This problem is perhaps made more difficult in the course of deregulating the power sector. At first glance, it is difficult to see how aims such as increasing the market share in competition and persuading customers to consume less could be compatible. However, many utilities do see DSM as an opportunity to keep customers with the aid of improved service, and possibilities to widen the business into a variety of services - even conservation related - are mentioned.

There is a wealth of literature analyzing the benefits and problems related to DSM, the ways in which costs and benefits should be allocated among shareholders, utility, state, participating and non-participating customers (e.g. Shioshanshi 1994). A lot of attention is given to the regulatory and market framework in which DSM can or should work (e.g. York 1993, De Almeida 1993). Another line of literature deals with the economic and psychological aspects of campaigns and arrangements, trying to find the most successful formulas (Shioshanshi 1991, McKenzie-Mohr 1994, Sharpe et al. 1993, Berry 1993). In the following, we point out some aspects that pertain to the idea of creating a commitment.

5.2 Ways to promote energy saving in households

In the following we will review some relevant examples of efficient ways to improve saving in households. Examples are partly derived from DMS experiences and partly from studies on household energy use.

5.2.1 Prices and tariff structures

Low prices that do not reflect the full costs of energy use are often seen as major obstacles for energy saving (Sioshansi 1991). Even when the average level of energy prices cannot be substantially raised for political reasons - higher fuel prices would hit hardest the households with the lowest income - different tariffs with prices varying with time or pattern of use could motivate energy efficiency. E.g. an experiment done in Finland resulted in significant savings by using prices based on the actual costs of each moment. The price changes were signalled to customers with colored light display (IVO 1994).

5.2.2 The way of presenting the information about conservation

It is not unimportant how the energy conservation messages are presented: vivid, concrete and personalized information from a credible source has been proved to be effective in capturing attention and affecting behavior (Aronson et al. 1963, Bordiga & Nisbett 1977, Coltrane at al. 1986, Stern & Aronson 1984, for an example from energy audits see Gonzales et. al. 1988). In Finland, energy utilities are seen as credible and natural sources for energy saving information (Muurinen 1994, Kiljunen 1994).

Some of Kahneman & Tversky's findings can be useful in this context, for example they have found that people are more concerned about losses than gains, and about immediate satisfaction or immediate risks more than remote ones (Kahneman & Tversky 1979, Kahneman et. al. 1982). These general principles apply even in energy conservation: having reviewed a number of conservation efforts, McKenzie-Mohr (1994) points out some factors that seem to make the efforts successful. One of these is stressing losses if present practices continue, rather than gains to be achieved with conservation (e.g. Gonzales et. al 1988).

5.2.4 Definition of collective goals

Reporting past successes in DMS, Eto and Goldman (1993) mention a 600 MW "conservation power plant" initiated by Sacramento Municipal Utility District. The concept was used clarify the fact that, to make up for the supply from a closed power plant, significant savings needed to be accomplished on the demand side. Various energy conservation

measures were used to achieve this conservation goal. Presenting the goal in this form makes it more concrete than a less specific way: the need is made clear, but so is the potential outcome.
Sharpe et al. (1993) report on Espanola community-based energy conservation. They stress the importance of presenting the project to the community as a business proposition. Customers were asked to invest in their energy future, in order to get a lower total energy cost eventually. A two-way communication throughout the project was also important.

5.2.5 Commitment

The link between attitudes and behavior becomes stronger when people commit themselves to their attitudes. Commitment to energy saving by households or individuals has in past experiences been strengthened by

- the foot-in-the-door technique
- participating in e.g. the home energy audit
- public commitment or identification
- goal setting

There are many successful examples of the so called "foot-in-the-door" technique. Individuals who make a commitment, even a very small one, are more likely to engage in more substantial behavior later. E.g. people who were asked to save aluminium cans for one week were more likely to recycle subsequently than those who were not asked to comply with the simple request (Freedman & Frazer 1966), or people who received a shower-flow restrictor along with information on conservation measures were more likely carry out other conservation measures, such as lowering the temperature of the house (Hutton 1982).

The point is to get people somehow involved in the issue so that they will start to see themselves as committed to energy conservation. Another way of doing this is to involve the customer, if only symbolically, in the audit, for example (Gonzales et al. 1988, Mc Kenzie-Mohr 1994).

Public commitment to a goal (and identification with that goal) has proved to be successful as a way of increasing energy savings as well as e.g. recycling (Weyant 1986). Homeowners who thought that their names would be listed in a public presentation of the results showed a lower rate of increase in the use levels of both natural gas and electricity than people who were told that they would stay anonymous (Pallak & Cummings 1976, Pallak et al. 1980). But private commitment or goal setting can be effective: in a study of Becker (1978) the effects of feedback could be improved by asking the participants to set a conservation goal. Families with a 20% conservation goal saved more than families with only 2% goals.

Shioshanshi (1991) has a suggestion in which both the idea of emphasizing losses and that of goal setting is taken. He proposes that an energy efficiency audit be mandated for a specified group of customers, and their energy consumption levels compared with a model or target efficiency standard. The target level could be established by an elected or government-appointed panel of energy efficiency experts representing consumer groups, utilities and others. The audit could be done by the utility, independent experts or a government agency. After the audit, the customer would have a finite period of time to bring the premises up to the target standard or face an "energy inefficiency surcharge" on top of regular bills. The improvements could be made and financed by the customer, who would then get the resulting benefit, i.e. lower energy bills, or by a company specialized in energy improvements, who would need to get a share of the resulting savings.

In summary, the private economic motivation can be used most fully to complement collective motives if tariff structures encourage conservation and rational timing of consumption. Information about conservation possibilities should focus on losses connected with present, wasteful practices, and be concrete and vivid. The collective goals for conservation should be concrete and immediate too, either in terms of the need to conserve, or in terms of the potential gain.

Commitment is important; besides small symbolic gestures, more real, goal-related ways to commit have been suggested and tried. A combination of these factors will improve householders' perception of their ability to influence energy conservation.

6. CONSERVATION AGREEMENTS WITH HOUSEHOLDS

We started this presentation by assuming that as well as knowledge, attitudes and resources, successful energy conservation efforts require a sense of the magnitude of the task and everybody's share in carrying it out. This assumption is based on findings by other students of energy and environmental issues.

So far, some agreements between industry and governments, and some DSM efforts seem to come close to our idea of commitment, and they were briefly reviewed in order to find useful aspects and problems.

We now outline a framework for conservation activities for households that we call conservation agreements. This framework takes into account the need for an explicit collective commitment in conservation, and the importance of showing all participants their share in the effort and their potential to act. We make use of lessons learnt from conservation agreements between industry and governments, and from DSM and other conservation activities with households.

The conservation effort begins with a political decision on overall conservation targets, based on international emission reduction agreements. This is being prepared in Finland now, as an energy conservation program is written for the government. These targets can be translated into average household electricity and heating consumption figures. We know a lot about variation in these levels due to technical, demographic, and other differences. Thus a finer level of target values could be calculated, taking into account such differences. These formulas should be developed by a group representing consumers, government and energy companies. This and the previous step are necessary, since concrete goal definition is needed. For a household, the concrete goal would be a theoretical consumption figure based on the overall national target on one hand, and on the specific circumstances of the household (e.g. number and ages of the household members, type of house) on the other hand.

Energy companies would then offer their customers energy deals. Consumption at a target level - assuming the target level is lower than present consumption - would result in a lower energy bill (and unit prices). If the customer wishes to consume more than the target level, the bill (and unit prices) would be higher. This kind of "increasing step tariff" has been used in North California for many years. A family gets a "lifeline" base consumption according to number of adults. Rates go up when consumption is over baseline. Such a price differentiation would make free riders less of a problem, because those not conserving would pay for it. Also there would be an immediate private incentive. This step is intended to create motivation and commitment. To avoid problems for low income households, financial assistance packages could be offered for energy improvements (but higher consumption rates should not be subsidized).

In some cases the customer might be a housing company with many households, rather than individual households. In these cases many improvements could be done by professional maintenance people. A part of the conservation would still be the responsibility of the individual households; the benefits of this part should be carefully allocated to the participating households. The agreement for lower prices where target levels are reached and higher prices for higher usage levels, could be repeated between the housing company and the households if the energy consumption is metered separately for individual apartments. In the case where it is not, the housing company would be motivated to do its best to affect the consumption habits of the residents.

The energy companies could offer their services to help customers improve their energy efficiency. In addition to the necessary feedback about consumption changes, services should range from information for do-it-yourself people to fixing and maintenance packages. There is no need to translate "commitment" and "participation" into "making conservation your hobby": it should also be possible to choose service packages that limit the consumer's role to paying bills and admiring the results. Different levels of checklists and audits could be offered, depending on the gap between the target and present energy consumption, and the needs of the customer.

The relative prices of energy vs. conservation should make conservation reasonable for customers and create natural markets for energy saving services and investments.

7. PROBLEMS

Each step in the outlined system has some problems, and we note some of the most obvious ones here. First, defining conservation targets at the household level would be difficult. While a formula can be developed based on available data in many countries, there would be endless possibilities to argue about which parts of the variation in energy consumption should be allowed, i.e. included in the formula, and which parts of the variation should be interpreted as a potential for conservation, thus being left outside the baseline consumption formula. Such decisions are tied to

varying interests and are thus fundamentally political - the various social issues will have to be weighted and valuated.

The problems at this stage would be carried over in to the next stage where energy deals would be made. It is likely that there would be complaints about unfair advantage and unduly strict targets. Some room for negotiation on targets (and prices) probably should be left. This negotiation could address combination of targets, tariffs and timing in a way that would strenghten the commitment to a solution that is acceptable to the household. If the practicies were perceived dictatorial, it would erode the sense of commitment.

In housing companies constituting of many apartments, the unit size would be better for agreements than individual homes, but problems might arise in allocating the savings that are made. In absence of metering by apartment, old practices used e.g. in charging for water use could be applied. The technical and fairness-related problems associated with metering would leave further room for problems in this context.

The audit and service business could be arranged in many ways - e.g. by energy companies or by independent companies. Whatever the system, some standards and quality controls would be needed so that this practical stage would not disappoint the parties committed to conservation.

Finally, there is a problem outside the immediate range of the outlined system. The political goals are set, and conservation is encouraged, but the fact that we are dealing with only one, perhaps minor, aspect of economics and society is painfully clear. To simplify the reasoning a little: if the goals are not pressingly credible it will be difficult to develop more detailed targets. In the absence of targets it is difficult to motivate conservation. To justify such hard work to energy companies, concrete emission reduction targets for energy producers would have to be set. If taken seriously they would, in many cases, result in controlling energy production levels - after other options have been exhausted. One way to make such targets serious would be to set up a system of marketable emission permits: in such a situation, conservation would have the potential to become a profitable business.

On the other hand, it is easy to see what steps would be taken if there is no pressing need or political will demanding conservation: no goals; no targets; no commitment; no measures; no conservation.

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