Energy
National Research Programmes 70 and 71

Project

Energy efficiency in households

Saving energy by means of variable electricity prices: what works and what doesn't

Saving energy by means of variable electricity prices: what works and what doesn't

Today, consumers pay a constant electricity price per kilowatt-hour, regardless of how much energy they consume. By contrast, variable tariffs could penalise high consumption and reward economy, thus providing a strong incentive to save electricity. Researchers at the University of Geneva have determined what such a system would have to look like so as to be both effective and accepted by consumers.

Modern kitchens with impressive refrigerators, ovens and steamers: new electrical appliances are generally more energy-efficient, but in many cases, the appliances purchased are more numerous, larger and are used more intensively, which means that part of the energy savings are lost. *Source:* iStock

At a glance

- Variable electricity tariffs constitute a promising approach for motivating consumers to save energy.
- Various approaches were examined: progressive tariffs that penalise higher electricity consumption, and bonuses that financially reward energy saving.
- The result: progressive tariffs lead to the greatest energy savings, but are unpopular with consumers. Instead, a combined bonus-malus system emerged as the best solution.

Axpo, Alpiq, BKW & Co: Swiss electricity suppliers play a major role in whether and how energy policy goals are achieved. They determine the sustainability of their electricity supply and fix the price of various electricity mixes. As yet, these tariffs are constant, i.e. power leaving the electric outlet always costs the same amount, regardless of how high total consumption is. Variable electricity tariffs, on the other hand, are a promising approach for motivating consumers to save energy.

Many consumers are aware of what needs to be done: doing laundry at lower temperatures, switching off lights when they are not needed, making sure that electronic appliances are not left in the standby mode but switched off. However, there is no real incentive to aspire to energy-conscious behaviour. Within the household budget, the cost of electricity consumption is not significant enough. Variable power tariffs should change this: their aim is to create a financial incentive for consumers to save electricity. The research teams of Martin Patel and Tobias Brosch at the University of Geneva have now investigated what type of tariff system can actually incite people to change their behaviour.

In a first step, the scientists undertook an overview study of previously conducted research work that had investigated variable tariffs in six countries, namely Canada, the USA, Japan, China, Germany and Switzerland. They were able to identify two different approaches. The first is a progressive tariff system that penalises higher electricity consumption by means of increasing power prices. The second approach is a bonus system, also known as an electricity saving feed-in tariff, which is also intended to encourage consumers to save energy, but with a reward system: those who consume less are rewarded financially.

Losses hurt more than missed profits

The new overview study shows that the two approaches are by far not equally effective: in all the countries surveyed, the progressive tariffs resulted in significantly higher energy savings than the electricity saving feed-in tariffs. Consumers are more strongly influenced by the fact that they have to pay more because of their wasteful behaviour than by the fact that they have the option to save the same amount of money by adopting the opposite behaviour.

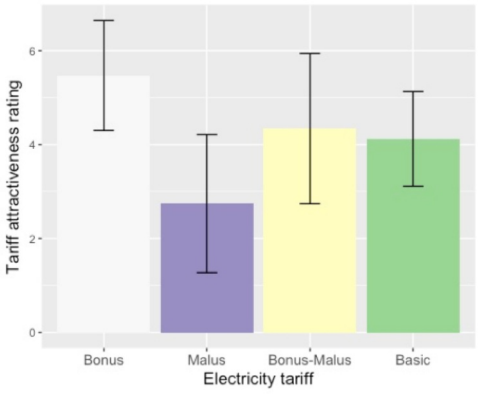
This tendency to assign more importance to losses than to profits is already known from behavioural research: experts refer to it as loss aversion. Due to this psychological phenomenon, a progressive tariff is a particularly strong motivator to change people's behaviour, also in terms of electricity consumption.

Voluntary decision

The researchers next investigated how consumers can be persuaded to choose such a power tariff. They conducted surveys in more than 1060 Swiss households. Participants were asked to evaluate the different tariffs. This assessment was performed with the help of decision experiments that determined which tariff system the respondents were more likely to accept. It became clear that electricity tariffs that reward savings are much more popular with consumers than those that financially penalise overconsumption. This is understandable, again due to loss aversion. But this also means that consumers prefer the measure that results in lower energy savings.

Solution: a combined bonus and malus scheme

However, the surveys also pointed to a solution: a tariff combining reward and penalty. The respondents reacted much more positively to a combined approach than to a pure malus scheme. Approximately one third of all households surveyed would agree to such a tariff system. This approach is important in view of the reduction of energy consumption but more effectively than a constant tariff ("Basic“). How well the variable tariffs were received by the individual participants depended mainly on their willingness to save, as well as on the values and emotions they expressed with regard to environmental concerns.



The graph illustrates the popularity of the different tariffs. The "bonus" scheme rewards the frugal. The "malus" scheme punishes the wasteful; "bonus-malus" is the combination of the two incentive systems, and is even more popular than the "basic" constant tariff. Martin K. Patel, University of Geneva

Such an incentive-based tariff system takes into account the total amount of energy consumed, but does not help consumers decide how they can save energy. One measure frequently mentioned in this context is the replacement of old electrical appliances with new ones that consume significantly less electricity. However, this procedure is associated with high costs, especially when it comes to large appliances such as refrigerators, washing machines and stoves. In the last part of the project, the researchers therefore examined whether and under what conditions it makes sense to replace the appliance stock in private households.

The results were sobering: firstly, new appliances do not automatically lead to energy savings. While they are more energy-efficient, consumers tend to buy increased numbers of larger appliances. As a result, the total energy consumption of stoves and dishwashers has slightly risen in recent decades. Secondly, switching to energy-efficient refrigerators or tumble-dryers is very expensive – too expensive so far. The researchers conclude that energy-efficient appliances must be available at significantly lower prices than is currently the case if substitutions are to happen.

From theory to practice

According to the researchers, variable electricity tariffs are still difficult to implement. The introduction of such a tariff is unattractive for power companies as they fear a loss of customers. Since 2009, major customers in Switzerland can choose their own power supply company, and in future this should be possible for all customers. In addition, a variable tariff system requires the installation of smart meters which precisely register the electricity consumed by each household.

The Geneva researchers conclude that a combination of various measures is the ideal solution: new, significantly more efficient household appliances; attractive smart meters; targeted and, in some cases, customer-specific information campaigns; and, if necessary, very specific legislative frameworks to prescribe particularly effective measures.

Produkte aus diesem Projekt

- Effect of tariff structure on mobilization of energy savings in households
  Date of publication: 13.11.18
- Efficacité énergétique au sein des ménages
  Date of publication: 13.11.18
- Recent experiences with tariffs for saving electricity in households
  Date of publication: 08.02.19
- Energie 2050
  Date of publication: 08.02.19

Contact & Team

Martin K. Patel
Institut des Sciences de l'Environnement
Université de Genève
Boulevard Carl-Vogt 66
1205 Genève

+41 22 379 06 58
martin.patel@unige.ch

Martin K. Patel
Projektleitung

Prasanna Ashreeta

Tobias Brosch
Universität Genf

Jasmin Mahmoodi
Universität Genf

Dasa Majcen

Selin Yilmaz
Universität Genf

Associated projects

Understanding household energy consumption

Social learning helps reduce energy consumption

Virtual competition for energy-efficient mobility

Games and competitions for more sustainable mobility

All information provided on these pages corresponds to the status of knowledge as of 13.06.2019.