# Study shows it is possible to save money and reduce carbon dioxide emission by using more energy

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Use 10 per cent more energy and save 10 per cent on your electricity bill. It can actually pay to use loads of energy when there is plenty available. Researchers can document this in a comprehensive study of how private consumers can achieve the greatest savings on their heating bill in a modern supply system with flexible electricity prices. Credit: Colourbox

What is the most optimal energy behaviour in everyday life with variable electricity prices? Researchers at Aarhus University have carried out extensive theoretical mapping of the way private consumers can save money for heating in a modern supply system based on electricity.

Surprisingly enough, the mapping shows that by using approximately 10 per cent more energy for heating, it is possible to save about 10 per cent on the heating bill, at the same time as protecting the environment with lower carbon dioxide emission.

## Use energy and save money

By means of building simulations and advanced calculation models, the researchers came to the conclusion that using plenty of energy is both an economic and an environmental advantage, while it is also inexpensive and green.

Their methods for this purpose included specially developed prognosis systems to predict both energy prices and the energy's carbon dioxide intensity.

"We experimented with intelligent management of energy consumption with the aim of minimising the cost of space heating without compromising user comfort. The result is that you can use large amounts of energy at night to heat up the thermal mass of the building, after which you can turn off the heating altogether in the morning peak and during the daytime, when the total power consumption and energy price are at their highest. You thus use more energy than you would without intelligent management, but you actually save money and take the pressure of the energy supply at the same time," says Associate Professor Steffen Petersen.

On the basis of their study, the researchers can also conclude that there

are major 'green' profits to be made with intelligent management of the energy consumption of buildings.

"If you choose to focus in the management plan on reducing carbon dioxide emission slightly, you'll achieve a significant environmental gain for a very small price," says Associate Professor Petersen.

He emphasises that the precise economic and environmental advantage for an individual household depends on the building's specific thermal conditions, but that the result of the study will under all circumstances have an impact on the construction industry.

"We made a theoretical study of how buildings can and should act in a future with fluctuating energy production. Our current savings logic falls short in this regard, so we have to start working in a completely new way on energy efficiency in buildings," he says.

## Towards intelligent buildings

One example today is that heating systems are often turned down at night to save energy and money when a building is not in use. In the energy system of the future, this would certainly save energy, but not necessarily money and carbon dioxide emission.

Instead of turning down the heating at night, the building's intelligent systems will actually increase the temperature because there are copious amounts of cheap power from sustainable energy sources.

In connection with mapping consumer habits, the researchers developed a system for the intelligent management of building operations, where it is possible to optimise a building's energy consumption regarding both price and environment.

During the course of 2016, they will try out the system in buildings in Aarhus, and subsequently ascertain the results of the theoretical mapping.

"We'll further develop the intelligent management so that a building automatically adjusts to consumer behaviour and comfort requirements in an energy-efficient way. I believe that in a few years it will be taken for granted that the building itself works out the heating requirement for the following day and when it is best and cheapest from an environmental point of view to use energy," says Associate Professor Petersen.

**More information:** Michael Dahl Knudsen et al, Demand response potential of model predictive control of space heating based on price and carbon dioxide intensity signals, *Energy and Buildings* (2016). DOI: 10.1016/j.enbuild.2016.04.053

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