Simulation models offer clarity with regard to energy transition decisions

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As a way of eliminating energy-guzzling incandescent light bulbs from our supermarket shelves, a tax on incandescent light bulbs would be just as effective as an outright ban. Subsidising new technology, such as Led lighting, could actually reduce its sales, as this can lead to a relatively large number of people buying a light with teething problems, giving the new technology a bad name. These results emerged from the simulation models which PhD student Emile Chappin of Delft University of Technology (the Netherlands) developed in relation to energy transition. Chappin obtained his doctorate from TU Delft on 16 June. His most important conclusion is that the energy transition process can be controlled and simulation models can provide insight into the possible consequences of choices made by the government, businesses and consumers.

Decisions

Where our energy will come from in the future will depend, among other things, on governments, businesses and consumers. "Energy systems develop on the basis of technical progress, but also on the basis of government policy instruments, business investments and consumer behaviour. These also influence each other", explains Emile Chapin, PhD candidate at the Faculty of Technology, Policy and Management. What are the consequences of closing the nuclear power stations in Germany? More coal-fired power stations? Capture and storage of CO_2? During his doctoral research, Chappin developed so-called 'agent-based'

simulation models which use knowledge of how people make decisions to provide insight into the short-term and long-term consequences of those decisions.

Fewer sales due to subsidisation

One of Chappin's simulation models reveals that levying a CO_2 tax would be a considerably cheaper and more effective incentive for reducing CO_2 emissions by European companies than the current European system of trading emission rights. Chappin draws this conclusion on the basis of decisions such as those made by investors and energy companies. Investors benefit more from a fixed CO_2 price than a flexible one, and energy companies opt for low cost of coal in the long term. On the basis of these results, Chappin came up with suggestions to improve the current system, for example introducing a minimum price on the CO_2 market and levying an additional CO_2 tax.

Chappin also fed his model with knowledge of consumer buying behaviour with regard to energy-efficient lighting. This revealed that in the slightly longer term, less Led lighting was purchased if this was subsidised in the initial phase. Because of the subsidy, a relatively large number of people bought the first generation of Led lights. The teething problems generated a negative image, as a result of which sales fell even though the technology later improved.

Chappin's simulation models offer politicians, policy officers, companies, engineers and consumers insight into the consequences their choices may have for the energy transition. To make the computer models comprehensible and easily usable, Chappin and his colleague researcher Laurens de Vries developed the Energy Market Game; an online game for policy officers wanting to test the effects of their policy choices, for example. Chappin: "I hope that with these models and the game I can make a meaningful contribution to the choices we must

make, as a country, to ensure we still have sufficient, affordable, clean energy in the future."

Provided by Delft University of Technology