Researchers develop 'learning' microwave ovens

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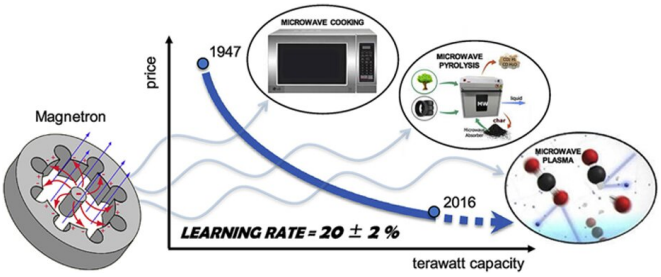

Credit: Remko Detz

In a publication in the *Journal of Cleaner Production*, Prof. Bob van der Zwaan of the Van 't Hoff Institute of Molecular Sciences presents the first example of a learning curve for microwave ovens, which follows a learning rate of around 20%. The paper discusses opportunities for possible microwave heating applications in households and industry that can contribute to sustainable development. Rapidly reducing prices could lead to a meaningful role of microwave technology in the energy transition.

Bob van der Zwaan is professor of Sustainable Technology at the University of Amsterdam and principal scientist at TNO Energy Transition. Together with his colleague Remko Detz, he analyzed the price reduction of microwave ovens and expressed this in a learning curve, which reveals a learning rate of 20%. The researchers project that at least two doublings in cumulative capacity of microwaves are probably still to come over the next few decades and, thus, a price reduction of close to 40%.

Contributions to sustainable development

Detz and Van der Zwaan calculate that the global installed capacity of microwave ovens, most of which are in households, is roughly half that of coal-based power plants. Given the high efficiency and the fact that these appliances can run on renewable electricity, the researchers foresee potential contributions to reducing CO_2 emissions. For instance, when market uptake in Africa and India increases, the microwave oven introduces a new, cleaner form of cooking, and as such, is likely to continue to contribute to sustainable development.

Detz and Van der Zwaan also make the case for industrial use of microwave technology as a relevant option for reducing CO_2 emissions. They can provide an alternative for drying and heating processes that are currently predominantly fueled by combusting oil or natural gas. Microwave reactors can also be applied in chemical synthesis. Microwave irradiation of gasses can create non-thermal plasmas that can be utilized to convert CO_2 and produce renewable fuels or chemicals.

Scale-up of novel industrial microwave technology from a sustainability perspective would substantially increase demand for renewable electricity. The rapid on-and-off response time of microwave heating could help to stabilize a future electricity system that has to cope with increased share of intermittent renewable energy, providing substantial flexible demand options. If a learning rate of around 20% sustains during the deployment of novel microwave technology options, prices may reduce rapidly and microwave technology could play a meaningful role in the energy transition.

More information: Remko J. Detz et al. Surfing the microwave oven learning curve, *Journal of Cleaner Production* (2020). DOI: 10.1016/j.jclepro.2020.122278

Provided by University of Amsterdam

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