Study highlights lower energy consumption thanks to daylight saving time

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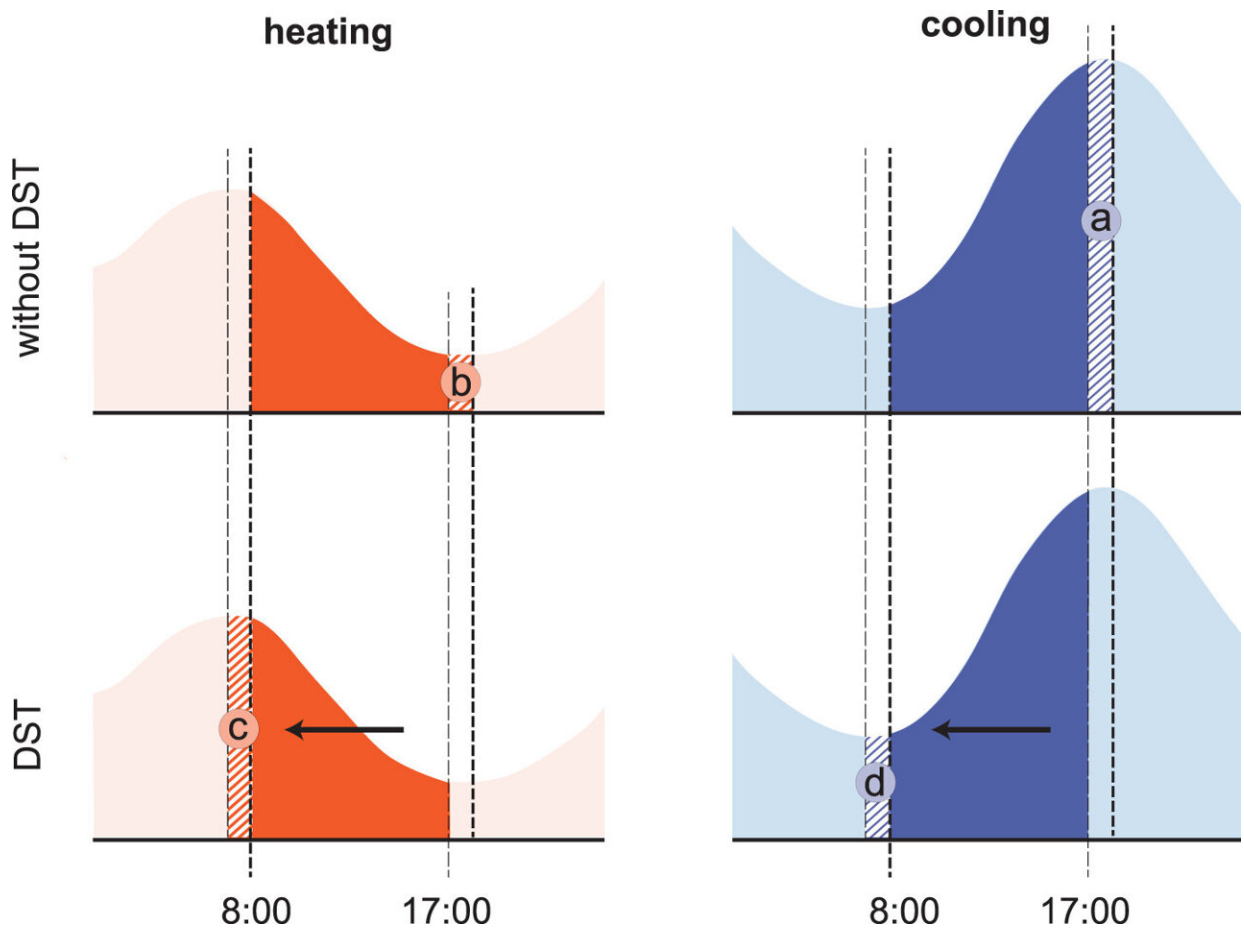

Conceptual representation showing the shift in working hours ahead by one hour with introducing daylight saving time (DST), compared to standard time (without DST) for a typical heating and cooling energy demand profile. Visualized idealized heating and cooling demand of a building, showing both working hour patterns. The portions of cooling or heating demand only required in one of the two modes (DST or without DST) are indicated with the areas labeled 'a–d'.

Credit: *Environmental Research Letters* (2023). DOI: 10.1088/1748-9326/acb0e3

This weekend it happens once again: Europeans will put the clocks forward by one hour. With the start of daylight-saving time, discussions break out—as they do every year—about whether or not we should eliminate the time change—both in politics and in the wider society. Opponents argue that the time change impacts our health, for instance through sleep disturbances. Proponents, on the other hand, often bring forward the argument of saving electricity because of longer days, which means that less artificial light is needed.

"That was the original intention behind the introduction of daylight saving. From our point of view, however, it makes sense to look not only at the impact on electricity savings in lighting, but on the overall energy consumption of a building," explains Sven Eggimann. Together with his colleague Massimo Fiorentini and other colleagues at Empa's Urban Energy Systems Lab, he has therefore determined whether and how the time change affects heating and cooling energy consumption. The findings are published in the journal *Environmental Research Letters*.

Going home earlier saves energy

The scientists' hypothesis was that employees start their work an hour earlier in summer due to the time change, and thus leave the office earlier in the afternoon. Since most of the cooling happens later in the afternoon, this can save energy. The assumption behind this is that in an empty office the cooling can be reduced or even turned off completely. As buildings become more intelligent, this would be relatively easy to accomplish in the future.

To test the hypothesis, the researchers simulated the heating and cooling

energy used with and without daylight-saving time for different climatic regions based on data from various office buildings in 15 US cities. In order to include the influence of climate change, they took into account not only the current climate, but also future climate scenarios up to the year 2050. This is crucial, as climate change has an enormous impact on a building's energy consumption. In another study, for example, Empa researchers found that in future Switzerland's demand for cooling could match the one for heating due to climate change.

The results of the current study should delight the proponents of daylight-saving time. "Switching to daylight-saving time can reduce an office building's cooling energy by up to almost 6%. At the same time, heating demand can increase by up to 4.4% due to the earlier start of work in the morning. However, since much more cooling than heating energy is needed in summer, the time change has a positive overall effect on the energy balance of a building," says Massimo Fiorentini. Across the different climate zones and scenarios, the overall energy savings varied—peaking at around 3%—but they were evident everywhere. Although this result only relates to office buildings in the U.S., it also provides valuable insights for Switzerland, as the climatic conditions are comparable for several of the simulated climate zones.

Contribution to climate protection

"Our study shows that the time change can contribute to climate protection. In the discussion about eliminating daylight-saving time, policy makers should therefore not only consider the electricity savings in artificial lighting, but also the impact on the energy balance of office buildings as a whole," says Eggimann.

At the same time, the researchers emphasize that the time change is only one of many ways to influence the energy consumption of a building. Technical improvements of the buildings, behavioral changes and a

general adjustment of our working hours can also contribute to energy savings and thus CO_2 reduction—regardless of whether or not we change the time every six months.

More information: Sven Eggimann et al, Climate change shifts the trade-off between lower cooling and higher heating demand from daylight saving time in office buildings, *Environmental Research Letters* (2023). DOI: 10.1088/1748-9326/acb0e3

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