Is energy saving or power cutting needed in buildings?

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Energy production is increasingly based on renewable energy. In summer, exchange-traded electricity is on average cheaper when solar power is abundantly available, and consumption is lower than in winter. In the winter, however, due to high demand, the price of energy is higher and fluctuates significantly. Severe frost problems can arise in energy production due to the freezing of windmill blades. This is even more pronounced during exceptional periods of windless weather, particularly during cold periods. In these conditions, wind power production can collapse, which buyers of electricity market notice as high average electricity prices and, in addition, large fluctuations in the hourly prices. This can make many electricity buyers miss a fixed-price contract.

Market-driven operations are tested during peak power and exceptional situations. At the political level, the need for weather-independent production is being discussed, which will keep energy prices moderate. Correspondingly, increasing weather-independent generation will improve the operational reliability of the generation system during exceptional weather periods. It is likely that, ultimately, the taxpayer, indirectly or directly in the end user's electricity bill, will pay for the additional resilience that is undoubtedly needed in the near future.

Often, when it comes to the discussion of reducing emissions, the focus is only on energy savings. The need for power is given less attention. Power adjustment with demand response (up or down) and energy savings are both critical factors in improving the energy efficiency of buildings. However, there are clear differences in meaning between them.

Power modulation means controlling and optimizing a building's energy usage in real time according to renewable energy production capacity. It allows you to manage the current power demand, which helps reduce peak loads and enhance the performance of energy systems. Reducing power during peak consumption ensures that the network's transmission capacity is sufficient. Similarly, increasing power usage can increase the efficiency of the use of renewable energy sources and shift consumption to a period when production emissions are low, e.g., by utilizing the energy storage capacity of buildings.

Energy saving, on the other hand, refers to the sustainable reduction of energy use. This means the introduction of energy-saving measures, such as better insulated envelope and heat recovery ventilation. Energy saving reduces the energy use of the entire building in the long term, like on a monthly and annual basis. In this way, the carbon footprint can be effectively reduced and carbon footprint targets reached.

In the near future, power control is becoming as important as energy saving. In electricity systems, tariffs are starting to pay more attention to the need for peak power. This is also important in both district-heated and hybrid-heated buildings. In hybrid heating, a heat pump is often used for basic heating, and, in addition, district heating is used to cover peak power. However, in these cases, it is worth using the cheapest energy carrier (either district heating or a heat pump) based on the hourly price. On an annual basis, most of the energy is still produced by a heat pump. In this case, the additional energy needed from district heating is relatively small, but the peak power required is high. This is reflected in the energy bill, so that the power cost can be clearly higher than the energy use bill. In these locations, the maximum power of district heating must be optimized so that the energy savings achieved are not wasted on an unnecessary increase in the power charge.

While both power cutting and energy saving aim to reduce energy use, power control focuses on momentary energy use optimization, while energy saving aims for long-term energy use reductions. By combining these strategies, buildings can achieve high energy efficiency, minimize costs, and promote environmental friendliness. This is important from both an economic and ecological perspective and contributes to sustainable development on a larger scale. All this requires improved smart readiness in buildings so that power and energy management can be implemented based on user needs and dynamic energy prices. This way, the targeted emission reductions can be achieved without compromising occupant indoor environmental quality. ■