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OPTIMIZING OPERATIONS IN NET-ZERO BUILDINGS

Prof. Paul Parker

Today, buildings account for nearly a third of global energy consumption. Net-zero energy structures aim to decarbonize the sector by generating as much electricity on site as they use each year. But what happens when their actual energy consumption is initially higher than intended?

In the case of a 100,000-square-foot office building recently constructed in Waterloo, Ontario, closing that performance gap required a complex process of optimizing the HVAC systems. WISE researchers were there to assess the results.

Paul Parker, Monika Mikhail, David Mather and Costa Kapsis used data from the building's 43 energy meters to compare consumption during 2019 — the initial year of operation — with the first six months of 2022 and analyze the impact of different commissioning activities. They also interviewed the building operator and energy advisor for additional insights into operational decisions.

A key improvement came from implementing gradual Monday morning start-up procedures to transition from unoccupied to occupied mode. Staggering the start-up times for the HVAC fan coils serving different floors reduced peak demand by an impressive 28 per cent.

Other actions included adjusting controls set-points for the humidification system, “right-sizing” fresh air intake rates to avoid over-ventilation and adjusting temperature set-points in the geothermal heating loop — all without sacrificing occupant comfort.

Altogether, HVAC optimization reduced overall energy consumption by approximately 15 per cent, putting the building on track to achieve net-positive status and achieve performance superior to the net-zero threshold in 2022. The research highlighted how continuous commissioning can deliver ongoing energy savings as the operator learns more about how the building behaves.



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