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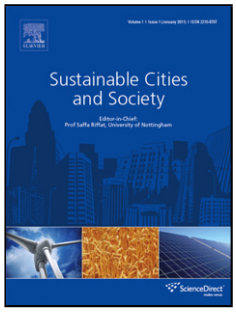

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Upscaling Energy Control from Building to Districts: Current Limitations and Future Perspectives

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1 - Highlights

- This paper critically reviews the state of the art of optimisation in buildings from both a building and a district level, and from both the supply and demand side
- It argues for the upscaling of building control and optimisation to a wider district level
- It presents the Computational Urban Sustainability Platform, CUSP, framework which aims to implement advanced building and district energy management underpinned by a semantic data model

Abstract

Due to the complexity and increasing decentralisation of the energy infrastructure, as well as growing penetration of renewable generation and proliferation of energy prosumers, the way in which energy consumption in buildings is managed must change. Buildings need to be considered as active participants in a complex and wider district-level energy landscape. To achieve this, the authors argue the need for a new generation of energy control systems capable of adapting to near real-time environmental conditions while maximising the use of renewables and minimising energy demand within a district environment. This will be enabled by cloud-based demand-response strategies through advanced data analytics and optimisation, underpinned by semantic data models as demonstrated by the Computational Urban Sustainability Platform, CUSP, prototype presented in this paper. The growing popularity of time of use tariffs and smart, IoT connected devices offer opportunities for Energy Service Companies, ESCo's, to play a significant role in this new energy landscape. They could provide energy management and cost savings for adaptable users, while meeting energy and CO_2 reduction targets. The paper provides a critical review and agenda setting perspective for energy management in buildings and beyond.

Keywords – Smart controls, Model predictive control, Energy, Smart grid, HVAC control, Building Energy Management, District Energy Management, Microgrid Control

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