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**ENERGY TECHNOLOGIES AND SUSTAINABLE DESIGN**

## Urban-scale Energy Analysis of the Built Environment

Welcome notes by:

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The use of transient computer simulations (e.g. TRNSYS, EnergyPlus) for quantifying energy use of individual buildings is now standard in both research and industry. However, their use has been computationally prohibitive at larger scales, in the context of thousands or millions of buildings within districts and cities. As a result, city scale analyses of the built environment, even when bottom-up, have to neglect or simplify dynamic and transient features of buildings. Yet, it is often that time-varying features (concurrence of peak energy demand) and dynamically interacting components (diurnal heat storage) yield the most economically achievable energy efficiencies.

We present a new city-scale energy simulation platform that offers a spatially differentiated, hourly analysis of energy consumed by the built environment. The City of Westminster, within central London, was chosen for the first pilot application of this simulation platform due to diversity of building types and high-energy demand. The lecture will highlight the challenges associated with its development, as well as future directions in the area of city-scale energy modeling of the built environment.

Dr. Ruchi Choudhary specializes in simulation methods for predicting energy demand of the built environment. She leads the multi-disciplinary 'Energy Efficient Cities Initiative' [EECI] initially funded by the EPSRC Science & Innovation Award (2008-2014) to Cambridge. Dr. Choudhary's current projects include (a) a new EPSRC project to develop new approaches to performing uncertainty analysis for energy management of non-domestic buildings (2014-17), (b) "Demand-side Management of Residential Buildings", a project funded by EPCO Inc., Japan (2014-17), (c) "Stochastic Energy Management Tools for Commercial Buildings" jointly funded by Liam O'Rourke & EPSRC (2014-18), and (d) "GreenHouse Energy Simulators", funded by EPSRC Impact Acceleration Award (2014) in partnership with Exergy, UK. Her recently completed projects include: "Energy & economic optimization in office refurbishments and Integrated Energy Planning of Districts" (2011-13, Buro Happold), "Residential retrofits for a low carbon future" (2009-12, City West Housing Trust), and "Decarbonising the Royal Botanical Gardens at Kew" (2011-13, Daphne-Jackson Trust & RBG Kew). She was co-I on "Geo-energy Systems Simulator" funded by the Low Carbon University Energy Alliance with Tsinghua (China) and MIT (USA) over 2010-13. She serves as the secretary of the board for the International Building Performance and Simulation Association (IBPSA) England chapter. She is a regular reviewer for journals in her area, for the UK research councils, and as scientific committee member of international conferences such as IBPSA, PLEA, and ISBE.