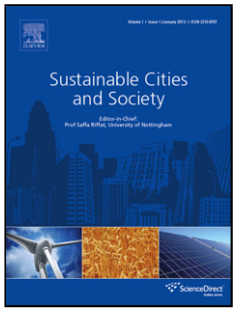

Title: The role of nearly-Zero Energy Buildings in the transition towards Post-Carbon Cities

Author: C. Becchio S.P. Corgnati C. Delmastro V. Fabi P. Lombardi

PII: S2210-6707(16)30196-2
DOI: http://dx.doi.org/doi:10.1016/j.scs.2016.08.005
Reference: SCS 477

To appear in:

Received date: 17-11-2015
Revised date: 24-6-2016
Accepted date: 3-8-2016

Please cite this article as: Becchio, C., Corgnati, SP., Delmastro, C., Fabi, V., & Lombardi, P., The role of nearly-Zero Energy Buildings in the transition towards Post-Carbon Cities.*Sustainable Cities and Society* http://dx.doi.org/10.1016/j.scs.2016.08.005

The role of nearly-Zero Energy Buildings in the transition towards Post-Carbon Cities

C. Becchio[a], S. P. Corgnati[a,*], C. Delmastro[a], V. Fabi[a], P. Lombardi[b]

[a]*DENERG - Politecnico di Torino, Corso Duca degli Abruzzi 24, Torino 10129, Italy*

[b]*DIST - Politecnico di Torino, viale Mattioli 39, Torino 10125, Italy*

** Corresponding author: Tel: +39-011- 0904507, e-mail: stefano.corgnati@polito.it*

Highlights:

- Reaching nZEB target for both new and existing buildings represents the PPC basis
- Cost-effective retrofit solutions cover a key role for reaching PPC target
- Occupant behaviour has a strong impact on nZEB real energy consumptions
- Mid/long-term scenarios analyses are the only opportunity for a successful city energy planning
- Advanced Input Models are fundamental tools for designing Post-Carbon Cities

Abstract

Nowadays about 50% of global population lives in cities, responsible for about 70% of GHG emissions and by 2030 the urbanization rate will increase to over 75%.

The paper analyses the new emerging concept of "Post-Carbon City" (PCC) and its main influencing factors regarding the building sector. It provides inspiration to re-think urban re-development patterns leading the way for new comprehensive approaches. In this new vision, energy and cost-effective retrofit of existing buildings cover a key role both in terms of saving potential and emission reduction towards nearly-zero energy building (nZEB) target. Moreover, in the building operational phase occupant behaviour has a strong impact on the real energy performance and its effect should be minimized. Therefore, these two issues should be mainly taken into account when energy city planning. Several mid/long-term scenarios analyses performed through quantitative energy demand forecasting tools - concerning not only the building sector, but the whole energy system - are the only opportunity to produce indications for an energy-oriented city planning. Finally, it highlights the necessity of new Advanced Input Modelling procedures to improve the effectiveness of measure recommendations derived through scenarios analysis.

Keywords: post-carbon cities; existing building retrofit; nZEB; occupant behaviour; scenarios analysis; energy planning

1. Introduction

Due to greenhouse gas (GHG) emissions effects on climate, nowadays, many challenges need to be understood and faced at the global, regional and local level. In particular, urbanization rate is forecasted to increase to over 75% in 2030; this