

Renewable energy generation and integration in *Sustainable Buildings* – a focus on eco-fuels

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A crucial issue in achieving sustainability from different perspectives is represented by the implementation of renewable energy in current built environment. Architectural constraints of listed buildings, preservation of historical centres or urban morphology are some of the barriers to RES deployment. To face the “renewable's revolution” [1], researchers and scholars should adopt a multidisciplinary approach composed by sensitivity to other fields together with wide knowledge.

Sustainable Buildings wants to lead this big challenge, providing contributions from several experts so as to make achievable the sustainability goal.

In this framework, my contribution will move towards the discussion on Building and District Sustainable Energy Systems, how and what renewable energy sources could be integrated and, last but not least, how green energy can interact positively with existing building stocks and city organism.

From an energy point of view, production, supply and consumption must be considered by all the actors and stakeholders involved in this transition. First of all, the production has to come from dedicated low-carbon and renewable energy sources in order to build a real 100% renewable energy system [1]. Yet, the goal should not exclude certain fossil fuels, such as Natural Gas, that can play a key role in short and medium term decarbonization scenarios [2].

Furthermore, the RES non-programmable nature could be managed with Power-to-Gas (P2G) option. So, energy storage is meant as solution for RES capacity firming. Several P2G solutions are available at each planning and management level from a single building to the National system [3]. Secondly, existing infrastructures cannot be forgotten in the present and future scenarios. Sometimes,

the strong constraints allows to decarbonize only the building energy supply by using the well-established networks.

In this way, eco-fuels are calling for a primary role in the race for sustainability. Bioenergy is one of the promising opportunity but, hybrid fuels are another ace in the hole such partial renewable bio-diesel and diesel blend, hydrogen enriched natural gas (H2NG), etc. Without any modifications in HVAC systems or other end-use devices, it is possible to supply them by eco-fuels so as to get immediate improvement of sustainability level, in terms of specific emissions or, in the case of H2NG, even improvement in thermodynamic efficiency [4].

Related to this latter point, several labels to certify the building performance were built along with many definitions [5]. The willing to make a building fit for purpose in terms of sustainable relation with users and environment, drives us to a common effort: a clear message from the *Sustainable Buildings* scientific community.

Then, the efforts in reducing energy consumption could be inserted in a wider vision such as building as one of the element of a district. Having said, new energy players as prosumers (PROducer-conSUMERS) [6] are all the nodes which moved from an univocal link to a centralized Grid to an interaction when equipped with renewable energy technologies. This bigger dimension of the energy issue expands the domain of the energy analysis involving also the territory as a source of renewable energy supply [7].

Energy hubs, demand side management, energy trading are some of the new entries in the energy scenario. Yet, critical modifications in the energy market as well as in the energy policy are more and more linked to geopolitical issues so as to make unpredictable many of their applications. Suitability to well-proven energy systems as mentioned for eco-fuels will play a primary role. So, pilot projects and real case studies will be decisive to deliver the

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new energy concepts. In this framework, the section “Building and District Sustainable Energy Systems” will be the hub to collect all those real experiences.

Sustainable Buildings covers all the different aspects so that to address the sustainability challenge in its entirety.

A special thank goes to the Editors-in-Chief, who collect all those expertise to pioneer this new scientific community's platform.

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Cite this article as: B. Nastasi: Renewable energy generation and integration in *Sustainable Buildings* – a focus on eco-fuels. *Sust. Build.* **1**, 2 (2016).