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Editorial Open Access

The Role of Demand Side Management in Buildings for the Future Energy Context

Arteconi A*

Università degli Studi eCampus, via Isimbardi 10, Novedrate (CO), 22060, Italy

***Corresponding author:** Arteconi A, Università degli Studi eCampus, via Isimbardi 10, Novedrate (CO), 22060, Italy, Tel: 390712204432; E-mail: alessia.arteconi@uniecampus.it

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Editorial

Where the challenge of market availability for non-dispatchable renewable energy is of paramount importance and requires investments for interconnection, energy storage and more dynamic energy systems, there the demand side management (DSM) strategies acquire more and more importance. DSM includes all programs designed to influence the customer's energy use, focusing on changing the shape of the load and thereby helping to optimize the whole power system from generation to delivery, to end use [1]. Considering that buildings account for around 40% of primary energy consumption in most countries [2], it is evident that there is a big potential for demand side management (DSM) strategy in buildings to enhance cost-effectiveness and renewable energy utilisation.

The electrical loads that can be controlled in a building are mainly lightings, appliances and heating/cooling systems driven electrically. Several appliances can be switched on/off without troubles for their operation and for users' satisfaction. Much more interesting is the demand side management of thermal loads. The mechanisms to put it into action involve different types of thermal storages:

The building envelope thermal mass

The heating/cooling system heat storage (radiators or floor heating)

External storage devices, e.g. water storage tanks.

They can be activated in a passive or active way and are aimed at shifting the demand to periods with lower electricity generation costs [3]. Passive storage systems (i.e. building thermal mass) do not require additional investment costs but an in-depth knowledge of the dynamic behaviour of the building is necessary in order to guarantee the internal thermal comfort. Active thermal storages, on the other hand, can allow much more flexibility in the operation, because they can supply energy when the energy production system is switched off by the grid request. Generally DSM redistributes the load but does not necessarily reduce the total energy consumed by the device because the load reduction periods will be followed or preceded by load recovery and, in some cases, the amount of energy recovered may exceed the amount of load curtailed because of losses in the storage or energy conversion process [4].

Moreover attention has to be paid to the new building roadmap and to the nearly zero energy building prescriptions by EU. In fact the latter are designed to have the energy balance almost zero, due to higher energy efficiency, that reduces the demand, and to the integration with renewable energy production systems, that allows to cover almost all the energy consumption. Such buildings are examples of demand side management directly on site, but they cannot participate effectively to DSM strategies that involve the overall electricity grid, having a marginal energy interaction with the network.

Concluding, DSM has a high potential to improve the efficiency of operation and reduce the investments of the electricity system, avoiding capacity expansion and new generation capacity. In particular, a key role is foreseen for the utilization of controllable electrical loads, such as heat pumps systems coupled with thermal storage [5]. It is of paramount importance that these aspects are considered in the definition of the future energy plan: incentives and or discounted energy tariffs should be introduced in order to increase the installation of devices with controllable electrical loads, control systems and energy storage at users' site and to compensate possible extra costs for participating in DSM programs, thus to enlarge the customers' acceptance towards DSM and bring into being a benefit for the community.

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