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Poul Alberg Østergaard[a*] & Neven Duic[b]

[a] Department of Development and Planning, Aalborg University, Aalborg, Denmark
[b] Department of Energy, Power Engineering and Environment, University of Zagreb, Zagreb, Croatia

ABSTRACT

This editorial introduces the 11th volume of the International Journal of Sustainable Energy Planning and Management. The volume addresses smart energy systems and the optimal ways of integrating renewable energy into these. Two of the contributions are from the perspective of energy storage with one arguing that other storage options are preferable to designated electricity storage. This includes thermal storages for house heating and gas and liquid fuel storage for e.g. the transportation sector. Secondly, a paper investigates more narrowly communal vs individual electricity storage in residential PV systems with a view to lowering grid dependency. Lastly, an analysis investigates the role of flexible electricity demand as a means to integrate fluctuating renewable energy sources such as wind and PV.

Keywords:

Smart energy systems;
Demand flexibility;
Community renewable energy networks

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1. Smart energy systems and electricity storage

Smart energy systems are becoming well-established in the scientific literature [1–6] as a supplement or maybe a wider application of what other researchers refer to as smart grids [7]. Analyses have already demonstrated the benefits and possibilities when observing the energy system from a wider perspective than simply from an electric perspective. In this volume, Lund et al. [8] explore storage systems in smart energy systems with a view to identifying the optimal storage solutions from an economic perspective both with respect to size and part of the energy system to include storage in. They observe storage costs in the electricity system that are significantly higher than storage costs in heating or for transportation fuels; costs are several orders of magnitude higher. At the same time, storage has a strong economy of scale quality, meaning communal solutions are preferable to individual solutions – or vice versa; for the same investment, significantly more storage may be introduced via communal systems.

Tomc and Vassallo expand on previous work on Community Renewable Energy networks (CREN) [9] investigating in this issue CRENs with different combinations of individual or communal photo voltaic production and individual or communal electricity storage systems [10]. A combination of individual and communal PV and storage can reduce grid dependency significantly – however not remove it entirely with the modelled system configurations.

2. Flexible demand

Where Lund et al. and Tomc and Vassallo focus on storage in energy systems as a means for integrating renewable energy into the energy system, Tveten et al. [11] investigate the effects of demand side flexibility on the integration of fluctuating renewable energy. This is

* Corresponding author E-mail: poul@plan.aau.dk

done both from an economic perspective – i.e. effects on income and expenditure for production unit and demand unit owners – as well as in terms of the ability of the system to integrate renewable power production measured in terms of greenhouse gas emission reductions. Demand flexibility is assessed to cause only minor reductions in electricity expenses and revenue for production equipment owners. Likewise, greenhouse gas emission reductions are minor. This supports previous findings by Kwon stating that *"Results from [an analyses of the level of flexible demand which makes a significant impact on the future energy system] the other analysis indicate that in order to have a significant impact on the energy system performance, more than a quarter of the classic electricity demand would need to be flexible within a month, which is highly unlikely to happen. The value of flexible demand in the energy system is thus limited."* [12] Irrespective of the small impacts, Tveten et al. conclude *"that increased [demand side flexibility.] is a promising measure for improving [variable renewable.] integration"*.

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