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Energy Scheduling of a Smart District Microgrid with Shared Photovoltaic Panels and Storage: the case of the Ballen marina in Samsø

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Keywords

microgrid, demand side management, renewable energy, energy storage, heat pump, district energy management

Extended abstract

This contribution focuses on the energy scheduling of a smart district where a microgrid is equipped with controllable (with flexible and programmable operation) and non-controllable (with fixed power profile) electrical appliances, heat pumps, photovoltaic (PV) panels, and a battery energy storage system (BESS). The proposed control strategy aims at a simultaneous optimal planning of controllable appliances and of the shared resources, i.e., the storage system charge/discharge and renewable energy usage. We formulate a linear programming energy scheduling algorithm to maximize the self-supply with solar energy and simultaneously minimize the daily cost of energy bought from the public grid under time-varying energy pricing.
The proposed energy scheduling approach is applied for the demand side management control of the marina of Ballen, Samsø (Denmark), where a smart microgrid is currently being implemented as a demonstrator in the Horizon2020 European research project SMILE. Simulations considering the marina electric consumption (340 boat sockets, a service buildings and the Harbour Master's office), PV production (60kWp), and BESS (240kWh capacity) are carried out on one year time series with a 15 minutes resolution. Results demonstrate that the approach allows exploiting the potential of local energy renewable generation and storage to reduce the marina's energy consumption costs, while complying with the users' energy needs.

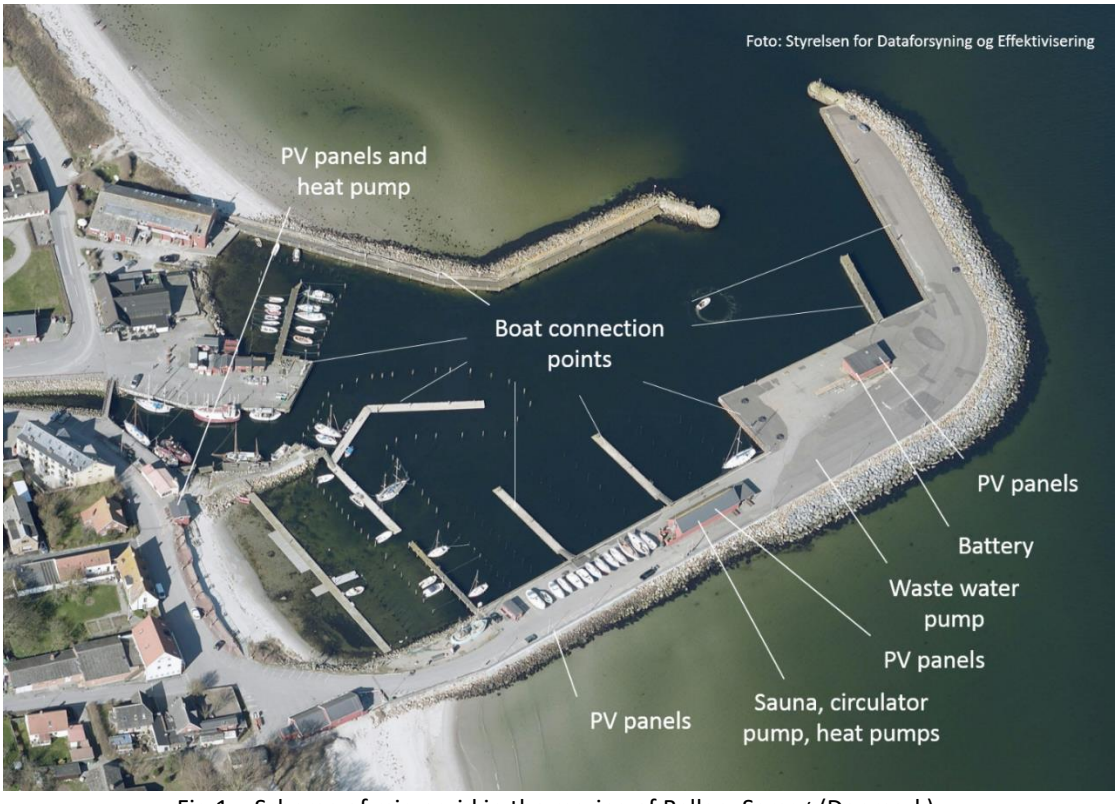

Fig.1 – Scheme of microgrid in the marina of Ballen, Samsø (Denmark).