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## DEVELOPMENT OF ENERGY EFFICIENT POWER SUPPLY SYSTEMS FOR MULTICOPTER DRONES

At the present day, the problem of reliable protection of critical infrastructure objects (CIO) from drone attacks, cruise missiles and other threats has not been solved. The development of intelligent technologies, communication systems, modern information and measurement equipment and multi-copter drones (MCD) make it possible to create an organized systems of MCD capable of performing various tasks, including creating mobile systems for adaptive protection of CIO. The use of renewable energy sources and wireless energy transmission systems makes it possible to place an autonomous power supply systems (PSS) for battery recharging in hard-to-reach places in the absence of stationary PSS and without the need for direct human presence. Some topologies of the MCD supply systems as well as their functional analysis were presented in [1]. The proposed solutions can be applied as PSS for MCD used, among others, for surveillance systems or air quality measurements (Fig. 1).

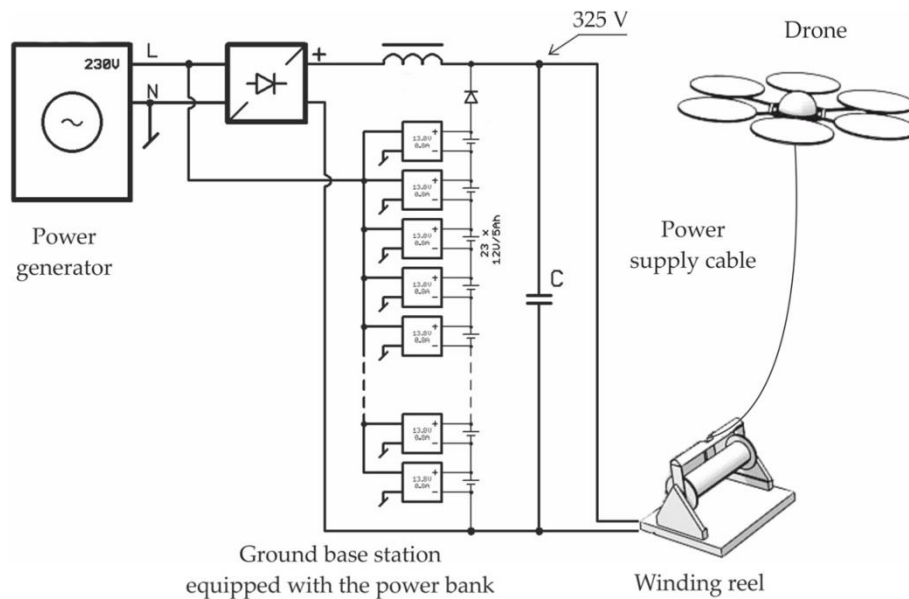


Fig. 1 – Basic blocks of the modular surveillance system supplied from the ground power supply system [1].

A minimized power consumption of the unmanned aerial vehicles (UAVs) can increase the degree of autonomy (range, speed, or operation time) [2]. The optimum sizing of PV-battery PSS for MCD-based cellular networks is considered in [3]. Fig. 2 shows MCD-based system structure in which two types of places, “areas” and “recharging sites”, are considered. A section of the region that should always be covered by a UAV is called an “area”, while a recharging site is a sector where PV-battery systems are established. The black line represents the radio link between the low level (LL) 5G base station on the UAV and the high level (HL) 5G ground-based base station [3].

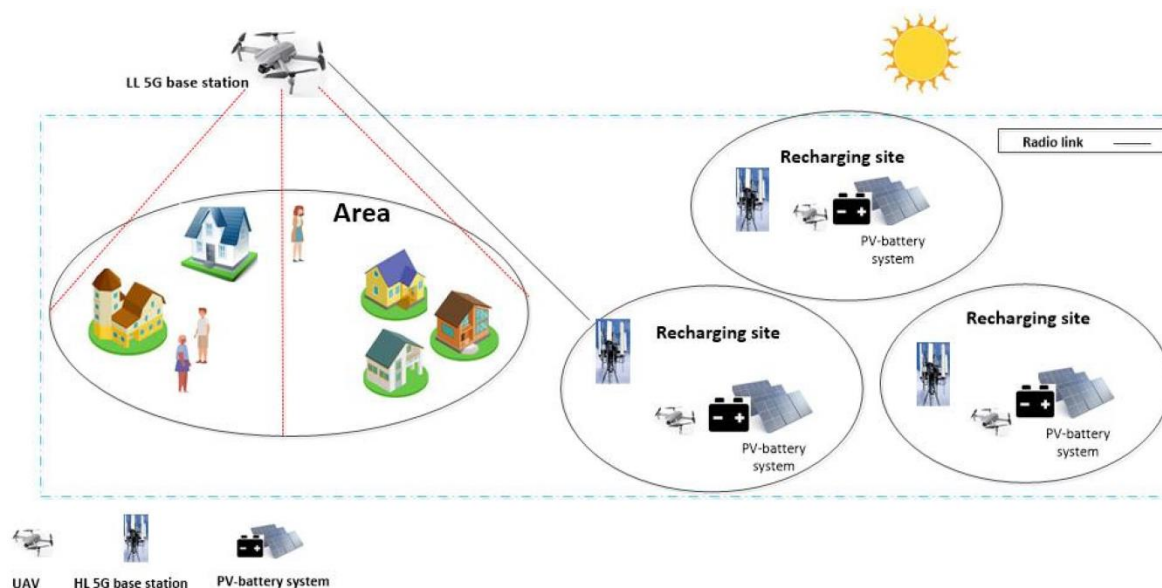


Fig. 2 – The configuration of an off-grid cellular telecommunication network with drone-based base stations powered by PV-battery systems [3]

The current research work comprises the tasks of the analysis and development of energy efficient on-board PSS as well as the highly-efficient ground-based PSS for MCD recharging. Some topologies of the quasi-switched boost converters [4] could be considered as possible ones for the on-board PSS. In such case, the main approaches for the autonomous PSS development should be taken into account [5]. In particular, assuming the requirements for the mass and volume limits for UAVs, the optimization of electricity consumption should be provided in order to minimize batteries and PSS sizes [6].

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