

Autonomous Taxiing Robot for Grid Resilience Enhancement in Green Airport

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Abstract : This paper studies the supportive needs for the electrical infrastructure of the green airport. In particular, the core objective revolves around the choice of electric grid configuration required to meet the expected electrified loads, i.e., the taxiing and charging loads of hybrid /pure electric aircraft in the airport. Further, reliability and resilience are critical aspects of a newly proposed grid; the concept of mobile energy storage as energy as a service (EAAS) for grid support in the proposed green airport is investigated using an autonomous electric taxiing robot (A-ETR) at a case study (Cranfield Airport). The performance of the model is verified and validated through DigSILENT power factory simulation software to compare the networks in terms of power quality, short circuit fault levels, system voltage profile, and power losses. Contingency and reliability index analysis are further carried out to show the potential of EAAS on the grid. The results demonstrate that the low voltage a.c network (LVAC) architecture gives better performance with adequate compensation than the low voltage d.c (LVDC) microgrid architecture for future green airport electrification integration. And A-ETR can deliver energy as a service (EaaS) to improve the airport's electrical power system resilience and energy supply.

Keywords : reliability, voltage profile, flightpath 2050, green airport

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