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How to transform lithium battery opportunities in field operational solutions for Telecom/IT application

Paper topic area : Battery evolution

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Project submission abstract

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Orange has worked since years 1980 on energy power systems evolutions and new disruptive battery technologies. At that time, sealed lead acid (VRLA) solution was selected, developed and tested in partnership with industry and then introduced for replacing about 100% of the centralized flooded lead-acid technology in back-up applications. The main results were universal free maintenance modular battery blocks with much lower hydrogen safety risk as presented in [1], allowing easier installation and replacement. In the 90's works, collaborative R&D e.g. with research laboratories have started on technologies for mobile terminals on Lithium battery replacing NiCd and then NiMH but not for stationary Telecom applications except for some alternative technologies such as very promising Zinc or Aluminum-air batteries not yet conclusive [2].

In the 2000's came the first available industrial Lithium battery, tested in lab and then after 2005 on site. They were associated with 400VDC powering systems in preparation of new high density networks equipment or datacenters servers [3] with advanced battery control monitoring ETSI standard [4]. In parallel work on VRLA batteries massively used in Orange networks was done to try to improve lifetime and better determine the state of heath [5]. At the same period, a more general investigation has led to synthesis of existing and not mature batteries for ETSI EE Workshop of 2013 [6].

The paper will shortly present the past investigation reminded above. Then it will focus on battery recent use cases and the associated set-up of test bed in Paris and Britany Orange Labs for an adapted and fast selection approach. This method is useful for evaluating new technologies and their integration to Telecom power systems, as requested by buyers and by network operational skill centers. This work provides also useful inputs to on-going European project Soogreen [7] and to ITU-T SG5 joint to ETSI EE standardization [8] of efficient methods of battery selection and test adapted to ICT/Telecom use cases.

The paper will detail some recent results of tests on proprietary Lithium 48V packs and racks, on Lithium Iron Phosphate prismatic cells and Battery Management Systems optimized for Telecom O&M. It will also present in the case of Nickel-Zinc cells from a French research laboratory [9] some research optimization work on the charge method and on the accelerated testing methods. In all cases, the paper will question the opportunity to replace lead-acid for some use cases and adaptation to new services such as Smart Grid and Energy Storage for Renewable Energy. In this respect, it the paper will also include information and recommendation to minimize battery environmental impact.