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Standby is a condition that may occur many times and for long periods in the operation of a Redox Flow Battery for stationary energy storage services in electrical grids (from a national grid down to smart grids, microgrids, …), so that the efficient operation of these batteries calls for specific standby management procedures, with the aim to minimize losses while avoiding dangerous conditions (e.g. solutes precipitation). This work describes the characteristics of a standby thermal management system capable of performing these tasks at a high efficiency. Its design resorts to an experimental and numerical investigation that made use of a cell-resolved dynamic thermal model to determine the stack voltage, self-discharge and temperature evolutions. Two different standby modes were analyzed: one with no continuous electrolyte flow (named "swamped standby mode") and the other with a small calibrated electrolyte cooling flow rate (named "streamed standby mode"). The critical conditions which may lead to V(V) precipitation were identified based on published information. As regards the swamped standby mode, an advanced strategy consisting of smart intermittent washings was designed and tested on an Industrial Scale-Vanadium Redox Flow Battery system, obtaining a dramatic reduction of self-discharge losses compared to a conventional fixed periodic washing. As regards the streamed standby mode, the optimal value of the cooling electrolyte flow rate that minimizes self-discharge was identified and tested. No sign of V(V) precipitation was observed in both modes, demonstrating that the thermal management system had always operated properly. Both standby modes are profitable in large scale vanadium redox flow batteries, being able to avoid critical thermal conditions while saving stored energy. Either one or the other can be adopted depending on the requested grid services, since the former can be used when a fast response is not needed and the latter allows keeping the battery ready to operate when more demanding services are required, e.g. in grid frequency regulation. In both cases, the stack is kept full of electrolytes, thus preventing triggering oxygen contamination and drying of residual vanadium inside the stack components, and also avoiding long battery startup times.

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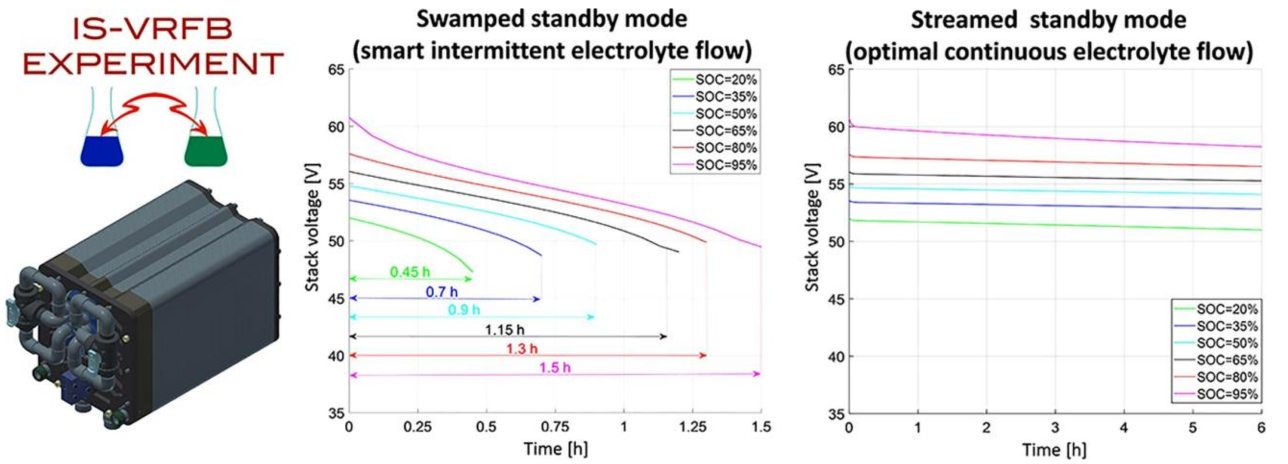

Fig. 1. IS-VRFB numerical stack voltage profiles at different initial stack *SOCs* and stack temperatures T_s = 30 °C, (T_{air} = 25 °C): swamped standby mode with no electrolyte flow and streamed standby mode with cooling flow Q_{cool} = 5 L min $^{-1}$.