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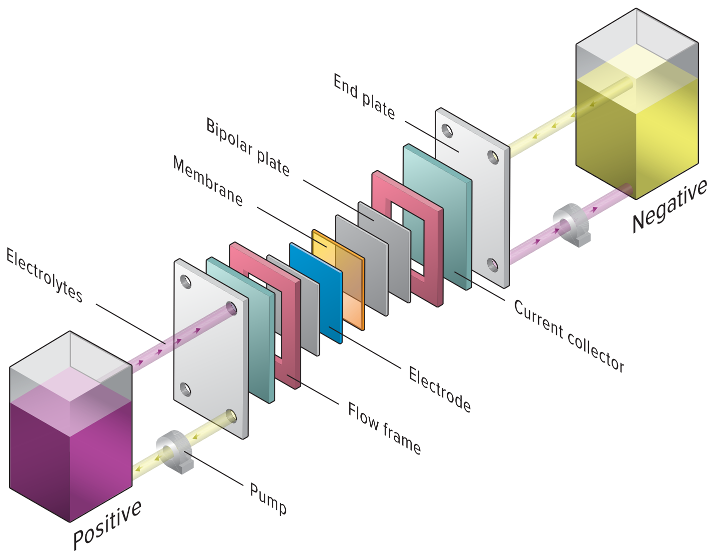
VANADIUM REDOX FLOW

Development platform for improved battery performance



The NRC's project team consists of senior researchers who specialize in electrochemistry and electrochemical engineering, polymers science engineering, heterogeneous catalysis, modelling of chemical and electrochemical processes, and process engineering.

BUILDING A BETTER BATTERY

Among the available options for stationary electrical energy storage, vanadium redox flow batteries (VRFB) gather interest for a number of reasons. VRFBs are suitable for both on-grid and off-grid applications, they exhibit relatively fast response times, their power and energy capacities can be sized and scaled independently, their design does not exhibit degradation through electrolyte cross-contamination, and they are inherently safe to operate at ambient temperatures due to their use of non-flammable components and reversible processes.

Despite their benefits and many successful system demonstrations, in order to achieve full commercial success, the technology must continue to achieve reductions in capital costs, and continued demonstration of the overall lifetime which currently has limited wide spread adoption of the technology. While mainly associated with two components – the vanadium electrolyte and the separator membrane – high capital costs also stem from the relatively low power density of VRFB, which in turn requires larger cells. Therefore, additional work is required to increase power density, develop longer-life components and lower critical materials costs.

OUR APPROACH

This project will take a systematic and detailed look at the phenomena occurring in the VRFB and their mechanisms. As the understanding of degradation mechanisms advances, findings will be fed back into the development of battery materials and components. In parallel, mathematical models of the degradation processes will be developed and combined with VRFB functional models, creating prediction tools for component performance and degradation. Validation of results will require development of accelerated lifetime testing protocols that will be used to evaluate the behaviour of VRFB components under a combination of operational stresses. It is expected that this project will provide VRFB component developers with lower cost and higher performing materials to help accelerate the deployment of the technology.

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