SUSTAINABLE INTEGRATION OF IRON REDOX FLOW BATTERY WITH A RENEWABLE ENERGY SOURCE

INTRODUCTION

Energy storage technologies are critical in meeting the constantly increasing demand for renewable energy sources such as solar, wind, and others. Due to their low operating costs, scalability and versatility, electrochemical energy storage devices (e.g., rechargeable batteries, flow batteries and supercapacitors) are considered the future electrical energy storage technologies. Redox flow batteries (RFBs) involving Fe, Zn, and V are widely recognized as potential storage options owing to the benefits of decoupling energy and power. The power and energy capacity of redox flow cells can be easily tuned and hence, energy storage flexibility improves. Power can be determined by the number of cells in the stack and the size of electrodes, while the concentration and volume of the electrolyte determine the energy storage capacity. Developing a high-performance iron redox flow battery (IRFB) can outperform the state-of-the-art storage batteries that are highly desirable as next-generation storage devices, particularly for storing large-scale electricity. The proposed project intends to assess the energy efficiencies and techno-economic feasibility of integrating a 500 W all-iron RFB system with a renewable energy source. Such innovative and sustainable energy storage technologies integrated with renewable sources align well with the current call with great novelty.

APPLICATIONS:

- The market readiness for Iron-based redox flow batteries is high. This technology uses eco-friendly, non-toxic, cost-effective iron salts as electrolytes. Compared to other material based technologies, the maintenance cost is also low in Iron-based RFB.
- The redox flow cell and bipolar plates were optimized using CFD analysis. The analyses found that the serpentine flow field exhibited the optimum results compared to the other flow patterns.



