

IPP details

NTU Faculty	Prof Alex Yan Qingyu
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School	School of Material Science and Engineering
Collaborating Company	VFlowTech Pte. Ltd.
IPP Project title	Improving the flow battery performance
Description of IPP Project	<p>VFT has commercialised the batteries for residential and small industrial application and currently working in developing large scale flow batteries (in MWh's) to use for large industrial application. This project aims to study the multi parameters in the large-scale flow battery development and address the R&D challenges to improve the technology and ensure higher efficiency and long life.</p> <p>Project topic: Improving the flow battery performance by reducing the various losses in development of multi kW to MW flow batteries.</p> <p>Flow battery uses battery stack modules (5 kW range for VFT), which are connected in series for power scale up. The number of stacks connected in series in one string can vary from 4 to 12. However, due to having electrolyte supplied from the single tank, shunt current impacts heavily reducing the system efficiency and reducing the stack life. There are various approaches used in the industry to minimize the problem but there is no as such preferred solution and the methods are not easily available. Therefore this project will focus on modelling the shunt current leakage in flow batteries and developing methods for reducing or eliminating the shut leakage. In this multi year research the candidate will develop several shunt models and experimentally estimate the losses. Ultimately, few solutions to be developed and implemented in our large products (100 kW -500 kWh system). Apart from this, the research project will focus on designing large tanks (ensuring uniform flow distribution, maximum utilisaiton, eliminating plug flow, etc.), pipings (maximizing the flow distribution, avoid stagnant flow, material research, etc.) together with pumps (horizontal pump, vertical pumps integrated with variable frequency drives), heat exchanger (suited for various weather conditions) keeping the system modular and scalable. While designing and development, the researcher will also be focusing on improving the safety aspect of the flow battery against leak, hydrogen safety, etc.</p> <p>The proposed IPP project will exactly fit to the described project as the problem statement are purely R&D</p>

	domain and it needs extensive research and developmental work before VFT can successfully commercialise the large batteries in Singapore and globally.
Requirements	<ul style="list-style-type: none"> · Bachelor/master's degree in mechanical, Materials Science, Physics or related. · Prior experience of working as Mechanical Engineer, preferably in fuel cell, redox flow, electrolyser or any other stacks · Experience with DFMEA and leading product from design to mass production. · Proven proficiency in 2D 3D CAD systems (e.g., AutoCAD, Solidworks) for design, documentation, and fabrication · Proficiency with Geometric Dimensioning and Tolerancing (GD&T) and moulding · Knowledge in modelling and simulation (e.g., COMSOL, Ansys or other similar software)
Duration of the project <i>(number of years)</i>	4 years for PhD
Period of the project <i><Format: mm/yyyy – mm/yyyy></i>	01/2023 – 01/2027