

REAL-TIME MONITORING SYSTEM OF DC MICRO-GRID WITH HEALTH PROGNOSIS OF RENEWABLE ENERGY

PROJECT OBJECTIVES

This project aims to develop a real-time condition monitoring system that can track the health of a DC micro-grid in real-time. With the data collected, the team is also able to conduct degradation studies to predict and prevent problems from occurring.

PROJECT SUMMARY

Under a research grant awarded by EMA in 2013, Singapore Polytechnic (SP) has developed an intelligent, modular, grid-connected micro-grid control system to which the system's renewable energy sources and loads are all of DC-type (e.g. Photovoltaic (PV) panels, DC air-cons, DC freezers, etc.). With DC micro-grids being more power efficient than traditional AC micro-grids, power loss during conversion is minimised.

Building on SP's experience in similar projects with BEARS and SIT*, the project team has developed a condition monitoring system that can track the health of the DC micro-grid in real-time, via sensors. With the data collected, the team is also able to conduct degradation studies to predict and prevent problems from occurring. Beyond this, the team intends to build a dynamic PV model to predict output power.

**From 2015 to 2017, BEARS (Berkeley Education Alliance for Research in Singapore) developed a real-time remote monitoring system for Phase 2 of the Pulau Ubin Micro-grid Test-bed, also under a grant from EMA. Since 2020, SIT and SP Group have been working on a project titled "Micro-grid Digital-twin Development for Effective Energy Management and Deployment", based on monitoring data obtained from the SP ONE living lab. Dr Fred Wei, a lecturer from SP's School of Electrical Engineering, served as co-PI during his time as a researcher in BEARS and SIT.*

PROJECT OUTCOMES

A control system unique to Singapore's environment:

- A DC micro-grid system with real-time monitoring that minimises costs and manpower by adapting sensors and freeing up cloud services.
- A renewable energy degradation model developed based on long time historical big data collection.
- Health prognosis function for renewable energy in DC micro-grid.

SOLAR PANELS



WIND TURBINE

