Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2022-49
Project Title:	Environment and Conservation Fund - Dynamic decarbonization audit and cost-efficient management system of multiphysical photovoltaic power generation systems in smart cities
Principal Investigator:	Dr Wang Minghao, Department of Electrical Engineering, The Hong Kong Polytechnic University. With effect from 1 September 2023, replaced by Prof. Xu Zhao, Department of Electrical and Electronic Engineering, The Hong Kong Polytechnic University.
Total Approved Grant:	$500,000
Duration:	1/7/2023 to 30/6/2026
Project Status/Remarks:	On-going
Project Scope:	Currently, 70% of carbon emission comes from electricity generation and net-zero electricity production has been tasked as one of the four primary decarbonisation strategies in Hong Kong's "Climate Action Plan 2030+". Considering the remarkable incentive Feed-in-Tariff (FiT) and harmonic compatibility of photovoltaics (PVs) in HK, PV generation systems are regarded as the most feasible green energy in Hong Kong and integrated into urban infrastructures, such as building façades, rooftops, etc. However, the essential decarbonisation effect of the invested PV systems is still vague and easily compromised by malfunction/abnormality, blinding the authoritative policy-making and discouraging public interest in promoting green PVs. To address these issues, a photo-electro-thermal perception, and management system will be developed to pinpoint the real-time carbon reduction and achieve the cost-effective management of PV generation toward sustainable green energy production. The proposed system will deploy multiphysical sensing technologies to monitor the real-time physical system states. A digital twin and AI algorithm will be developed to evaluate the dynamic decarbonisation effect and diagnose potential faults. A cloud-based management platform will be constructed to archive and visualise the system's decarbonisation performance and physical states. The proposed system can provide PV decarbonisation information for the public and contribute to timely maintenance advice of PV systems.
Summary of the Findings/ Outcomes:	To be available upon completion of the project