

News Article for RISUD Joint Research Fund

- | | Name | Department |
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| 1. Principal Investigator: | Dr Huan-Feng DUAN | CEE |
| 3. Project Title: | Feasibility Study of Hybrid Floating Solar-Wave Converter Hub (FloSWACH) Towards Sustainable Energy Development and Its Applications in Hong Kong | |
| 4. Annual Progress/Achievement (<i>in layman's language, no more than two A4 pages, pls attach a few figures</i>) | | |

This project aims to study the feasibility of a proposed hybrid solar-wave energy conversion system, termed as *FloSWACH*, through the innovative development of floating structures in Hong Kong waters. During this reporting period (i.e., first year of the project), the proposed research objectives and plans have been well achieved under the close collaborations among the team members, which includes following aspects:

(1) Conceptual designs:

The proposed *FloSWACH* system has been well designed through the conceptual understanding and proof from the brainstorm of the project team, which has included the advantages of current and other system designs and at the same time considered the improvements of possible limitations and shortages from the existing systems of floating structures and energy harvesting. Three selected designs (FPV, AFPV and BFPV) are shown in Figure (A) below.

(2) Numerical analysis:

The designed systems, which consists of many different types and configurations, are firstly evaluated through the numerical simulations and comparative analysis for their performance in different aspects (energy conversion, stability, etc.), so as to seek the optimal or quasi-optimal design scheme(s) of the *FloSWACH* system. The plan of numerical settings can refer to Figure (B) below.

(3) Experimental tests:

Experimental testing is an important and essential approach to validate and verify the designs from concept of proof and numerical analysis. We have conducted preliminary experimental tests with relatively small scales in the Hydraulics Lab and Solar Simulation Lab at PolyU (the scale is relatively small due to space limit), by referring to Figure (C) below. Specifically, the performance of each design for the proposed *FloSWACH* system has been tested in different aspects of stability, capability, and efficiency.

With these plans and methods as well as the implementations, this project so far has produced remarkable outputs and deliverables, including:

- (1) 2 JCR-Q1 journal papers and 2 international conference presentations.
- (2) 4 relevant research projects secured by team members (3 funded and 1 is approved).

- (3) 2 patents/copyright are currently under preparation for application and 2 invited keynotes presented in international conferences.
- (4) Many different collaborative/joint activities among members and between the team and other world-leading researchers/groups worldwide (e.g., seminars, meetings, joint research projects, and staff/student supervision).

Based on these achievements, this joint project is progressing satisfactorily, which can meet very well the proposed plan and schedule. Meanwhile, all the team members of this project have been actively involved in this collaborative work. It is expected that more outputs and deliverables will be achieved from such inter- and multi-disciplinary research collaborations by the team. in the next stage.

