CLP RESEARCH FELLOWSHIP PROGRAMME

GENERAL GUIDELINES

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1. Background and Purpose

Academic research and development (R&D) is the main source of forefront technological/engineering knowledge and innovation. To that end, CLP aims to support academic R&D projects in the energy-related sector. Herein, the CLP Research Fellowship Programme is established to support researchers based at Hong Kong universities. The nature of this programme is to support a variety of energy-related projects such as: pilot or feasibility studies, collection of preliminary data, secondary analysis of existing data, self-contained research projects, and development of new research technology/methodology.

2. CLP Research Fellowship Programme

The following table depicts the general framework of the CLP Research Fellowship Programme.

CLP Research Fellowship Programme	
Applicant	ONE Principal Investigator (Research Assistant Professor and above)
Research Topic	Selected Technological Focus Areas (see appendix)
Budget (HKD)	CLP will sponsor 100% of research funding for personnel (maximum HK$400K pa)
Duration	One year (Target to start from Dec 2022)
Selection Criteria	2-page Project Proposal (longlisted) and Presentation (shortlisted)

CLP Research Fellowship Programme aims to award two Fellowships for the inaugural academic year (2022-2023).

Applicants must have the capability to complete the whole research programme based on the milestones and deliverables set.

The CLP Research Fellowship aims to support the basic remuneration of a researcher (personnel) and other incurred expenses. By using the CLP Research Fellowship, the Principal Investigator is responsible to settle the salary payment of their corresponding researcher, and any other essential expenses (such as Mandatory Provident Fund (MPF), health/life insurance, procurement of tools/equipment/materials, auditing fees (if required), subscriptions, patent/IP applications, rentals of any kind, travelling expenses, etc.). CLP will not provide any additional financial support other than the promised fellowship. The fellowship awardees / researchers should conduct their research works at their affiliated universities. CLP is not responsible for the costs of any venues/laboratories/materials/equipment/tools, as well as other consumable costs in conjunction with the research. In addition, CLP would not be responsible for the compensation of any damages in conjunction with the research works, as well as any injuries/death of research personnel or others.

CLP respects Intellectual Property (IP) rights and complies with all applicable copyright laws, regulations and guidelines. In general, CLP agrees that IP created by the applicant, shall belong to their hosting university(s).

Important dates:

Programme Launch	1 September 2022 (Thursday)
Submission Period	1 September 2022 (Thursday) to 30 September 2022 (Friday)
Submission Deadline	**30 September 2022 (Friday) 5:00pm**
Inform shortlists for interview	Week of 17 October 2022 (Monday)
Panel Interview	7 November 2022 (Monday) to 8 November 2022 (Tuesday)
Inform Awardees & Applicants	15 November 2022 (Tuesday)
Project Kick-off*	December 2022

*Subject to the final approval of CLP Research Fellowship Programme Review Panel.

3. CLP Research Fellowship Programme Review Process

3.1 Introduction

The CLP Research Fellowship Programme review process comprises 2 parts, (i) Project proposal assessment and (ii) CLP panel interview. Project proposal assessment is the first screening stage to shortlist a maximum of 6 potential projects among all received applications. CLPRI will assess the research capability of relevant team applicants, and suitability of their project proposals with respect to CLP expectations. Next, shortlisted applicants are invited for a panel interview to present their ideas and research methodologies.

3.2 Research Topics

CLP has a selected Technological Focus Areas that interest CLP. Team applicants should develop their research project proposal based on ONE of these topics. The research topic areas are as below:

- Adoption of AI-based dynamic Power Generation process modelling to optimize the performance under transient environment
- Behavioural change of customers who regularly view smart meter data on energy conservation and if this behaviour can help reduce "high-load" calls
- EV Charging Infrastructure Planning
- Identification and analysis of irregularity readings obtained from Smart Meter
- Implementation of Virtual Power Plant (VPP) in Hong Kong
- Load disaggregation and analysis via Smart Meter data
- Utilization of Smart Meter to optimize power consumption
- Any other research topics related to energy

Details of research objectives can be found in Appendix 4.1

3.3 Project Proposal Assessment

Part A. Applicant's Research Capability

Part A of the assessment is designed to quantify the research capability and experience of the applicant and provide a general reference score for comparison.

Part B. Project Proposal

Part B of the assessment will focus on the research project itself. To evaluate the associated (1) project outline; (2) project deliverables; (3) project milestones; (4) technical challenges / risks; and (5) additional merits. The aim is to select the most relevant and promising project.

A maximum number of 6 team applicants will be shortlisted and invited to the CLP Review Panel Interview for further consideration.

3.4 CLP Review Panel Interview

The CLPRI Review Panel comprises senior members from CLP, as well as CLP Distinguished Professors and/or experts with relevant background (total 4–6 persons), with the aim to achieve a consensus decision to awarding the CLP Research Fellowship. CLP Holdings Professor of Sustainability, Prof. Charles W.W. NG, as well as CLP Power Chair Professor in Nuclear Engineering, Prof. Chin PAN, will be invited as guest panellists. A brief profile of Prof. NG and Prof. PAN can be found in Appendix 4.2 and 4.3 respectively.

The Review Panel Interview for each applicant should be completed within 40 minutes:

(1) Presentation (15–20 mins) delivered by the applicant should cover:
   a. A brief introduction to the applicant and their research capability
   b. Details to explain and elaborate on the whole project plan (such as methodologies, deliverables, project milestones, and future development)

(2) Q&A Session (15–20 mins)

The CLP Review Panel will select a maximum number of 2 potential awardees for final approval. In case there is no suitable applicant identified, CLP reserves the right to invite other applicants for interview. Otherwise, CLP may consider withholding the award of the Research Fellowships for the year. All CLP Review Panel Interviews should be conducted **within two months** from the end of the application period.

4 Project Monitoring and Disbursement of CLP Research Fellowship

4.1 Project Monitoring

The Principal Investigator / Researcher is required to submit a progress report after a 6-month period and a final report (upon completion of 12 months research) to reflect the latest research progress according to the stated milestones to seek CLP approval. The Principal Investigator / Researcher would be asked to conduct a presentation (either in-person or via online meeting software) against the research progress. Any non-compliance of reporting requirements (e.g. delay in submission of report(s), report quality not to the satisfaction of CLP) may affect the disbursement of following fellowship instalments. CLP may organise on-site visits to examine the research progress.

4.2 Disbursement of CLP Research Fellowship

Disbursement of fellowship to the Principal Investigator will be made by instalments, which will be contingent upon meeting the below terms.

Instalment	Percentage of Total Research Fellowship	Requirements
1st	60%	Upon signing the research agreement between CLPRI and fellowship awardee (i.e. Principal Investigator)
		Completion of a progress report after a 6-month period, the corresponding results have met the prescribed milestones and is accepted by CLP
2nd	40%	Upon completion of the final project report, the prescribed project deliverables have been accomplished and is accepted by CLP

CLP reserves all the rights to terminate the research project or withhold the disbursement of the final portion of fellowship for reasons which include (i) lack of progress of the project against the agreed

milestones, and (ii) slim chance of completion of the research works according to the original project proposal.

5. Appendix

5.1 CLP's Selected Technological Focus Areas and Detailed Deliverables

- Adoption of AI-based dynamic Power Generation process modelling to optimize the performance under transient environment
- Behavioural change of customers who regularly view smart meter data on energy conservation and if this behaviour can help reduce "high-load" calls
- EV Charging Infrastructure Planning
- Identification and analysis of irregularity readings obtained from Smart Meter
- Implementation of Virtual Power Plant (VPP) in Hong Kong
- Load disaggregation and analysis via Smart Meter data Utilization of Smart Meter to optimize power consumption
- Utilization of Smart Meter to optimize power consumption
- Any other research topics related to energy*

Below are the research deliverables that is CLP expecting, applicants are welcome to propose their planning deliverables based on these topics.

*Meanwhile, applicants are also welcome to propose other research topics if they have other ideas in mind that may interest the CLP Research Fellowship Programme Review Panel.

Adoption of AI-based dynamic Power Generation process modelling to optimize the performance under transient environment

- to review and analyse different academic and industrial predictive modelling and optimisation algorithms available
- to identify, develop and adopt the most appropriate methodology to implement on Power Generation processes
- to develop the AI-based digital twin model(s) of critical components in Generation Process for establishing the virtual and target Generation Process and performance, and identify the improvement areas
- to adopt and train continuously AI-based mechanism to carry out predictive modelling to attain best system efficiency and stability under different Realtime scenarios, including from different types of renewable energies and energy interconnection
- to consider the proposed digital twin interfacing with the control loop or other upcoming systems
- to develop the desktop platform for carrying the proper simulation of Generation Process and able to carry out different What-if analysis

Behavioural change of customers who regularly view smart meter data on energy conservation and if this behaviour can help reduce "high-load" calls

- to review the efficacy of Smart Meters against reducing customers "high-load" calls
- to identify whether customers who regularly view smart meter data will have an impact on the energy consumption behaviour
- to study and reveal customers' "high-load" calls behaviour, and hence predicting the probability in receiving "high-load" calls from customers against their real-time power consumption circumstances

EV Charging Infrastructure Planning

- to develop mathematical models / algorithms to predict upcoming EV charging loads
- to explore different types of non-wired / non-network infrastructures options to meet the EV demand
- to identify of optimum EV charging locations and quantities
- to optimise EV charging loads via real-time control to ensure electricity is evenly distributed to all EVs

Identification and analysis of irregularity readings obtained from Smart Meter

- to develop effective Smart Meter data analytic algorithms / mechanisms to identify abnormality cases in power consumption patterns / scenarios, and hence deducing the root causes (e.g. stealing of electrical power, interfering Smart Meter operations and readings, etc.)

Implementation of Virtual Power Plant (VPP) in Hong Kong

- to review the development and deployment of VPP around the world, and their key roles in the power grid
- to study the effectiveness of VPP based on heterogeneous DER/controllable load to serve different requirements of the power grid
- to review and study in details how VPP can work in conjunction with Peak Demand Management to improve peak shaving efficacy and the underlying revenue/cost
- to identify technical enablers for the communication between DERs, DREM and the utility
- to confirm the need to develop dedicated algorithm and/or methodology for CLP Power to achieve such VPP regime
- to identify impacts or changes on the power system design or operation e.g. tariff, customer incentive, network development, voltage or frequency control and spinning reserve
- to propose a roadmap for an VPP in Hong Kong

Load disaggregation and analysis via Smart Meter data

- to review and study different Load Disaggregation applications by utilizing smart meter data or other technologies to develop an accurate and effective solution to identify a household's energy consumption by individual appliances

Utilization of Smart Meter to optimize power consumption

- review the latest Smart Meter technologies and identify possible energy saving applications in HK using the smart meter data, including but not limited to, using AI-based mechanisms to provide notifications to customers in reducing unnecessary power usage

5.2 CLP Holdings Professor of Sustainability, Prof. Charles Ng

Professor Charles Ng, CLP Holdings Professor of Sustainability at the Hong Kong University of Science and Technology (HKUST), has a keen interest in the survival of our planet.

He is a frontier explorer of geo-energy and geo-environmental engineering. His research ranges from energy foundations for the heating and cooling of buildings to wind farm development and submarine landslide challenges in deep-sea extraction of methane hydrate, a potential source of energy-intensive fuel.

He is also a leading global authority on advanced unsaturated soils mechanics and eco-friendly green slope engineering. Not only is he determined to do something to enhance the long-term viability of the Earth, he is doing it through a wide range of research including the shifting soils and debris that form the world. Specifically, he aims to generate ideas and practical engineering solutions that will help reduce the impact of debris flow and make the planet more sustainable in the long term.

5.3 CLP Power Chair Professor of Nuclear Engineering, Prof. Pan Chin

Professor Pan Chin, the CLP Power Chair Professor in Nuclear Engineering at the City University of Hong Kong (CityU).

Apart from researches in reactor thermal hydraulics, micro and nano scale heat transfer and multiphase flows for energy applications, Prof Panis also an internationally well-recognised scholar in the fields of boiling heat transfer and two-phase flow.

Prof Pan has immense experience and dedication to both academic teaching and R&D areas. He served as Chairperson of the Department of Engineering and System Science, formerly the Department of Nuclear Engineering, of NTHU, Founding Director of the Centre for Energy and Environmental and the Low Carbon Energy Research Centre and Dean of the College of Nuclear Science.

He also served as Chairperson of the Advisory Committee on Nuclear Safety of Taiwan's Atomic Energy Council, Convenor of the Energy Programme of the Ministry of Science and Technology of Taiwan, and President of the Chung-Hwa Nuclear Society.