Emmanuel Binyet (仁飄零)

Research Center for Environmental Changes (RCEC), Academia Sinica
No. 128, Sec. 2, Academia Rd., Nankang, Taipei, Taiwan 115
Office Tel: +886-2-33668422
Email: emmanuelbinyet@hotmail.com
Lab website link: www.rcec.edu.tw

EDUCATION

2013/09 – 2020/06 Ph.D. Depart. of Power Mechanical Engineering, National Tsing Hua University (NTHU), Hsinchu

2008/09 – 2011/01 M.S. Power Engineering Institute, Huazhong University of Science and Technology (HUST), Wuhan

2003/09 – 2006/12 B.A. Depart. of Mechanical Engineering, School of Engineering Geneva, University of Applied Science (UAS), Switzerland

EMPLOYMENT

2021/01 – present	Postdoctoral Researcher	RCEC, Academia Sinica, Taiwan
2018/09 - 2020/12	Part-time Martial Arts instructor	UFC gym, Ants gym, Taiwan
2017/12 - 2018/12	Part-time engineer	ITRI, Taiwan
2013/01 - 2013/08	Fire safety engineer	BG Consulting Engineers, Switzerland
2011/12 - 2012/12	Research assistant	School of Engineering Geneva cmefe, Switzerland

HONORS & AWARDS

2021 The Phi Tau Phi Scholastic Honor Society of Republic of China

2017 CTCI Life Grant and Scholarship for International Graduate Students in Taiwan

RESEARCH INTEREST

My own research interests mostly include Fluid Mechanics related topics such as Fluid-Structure Interactions and Vortex-Induced Vibrations; fluid flow interacting with deformable structures has countless practical applications and is very difficult to predict. Actually, I have always been fascinated with renewable energy and environmental preservation. My current research project is related to energy policy and net-zero emissions strategies; we are modeling feasible pathways towards net-zero by 2050 in Taiwan. For the supply side, those scenarios rely on an emission-negative electricity generation mix coming from renewables as well as bioenergy and carbon capture and storage. On the demand side, scenarios rely on drastic reforms within all sectors in terms of energy efficiency, fuel switching, behavioral changes and carbon capture and storage. Stronger incentives such as expensive carbon taxes are needed to trigger technological investments.

RESEARCH HIGHLIGHTS

1. Demand response potential

On the electricity grid, balance between generation and consumption must be maintained at all times while limiting power fluctuations causing grid stability issues. Demand response (DR) allows reduction of peak loads by shifting or reducing consumption upon notification from the grid operator. Demand response is either incentive-based, where participants surrender control of some of their load to the grid operator, or price-based, where participants react to electricity price signals. DR improves grid reliability and reduces the need for peaking plants often relying on natural gas. Moreover, because of the added demand-side flexibility, DR enables higher intermittent renewables and electric vehicles penetration rates because it contributes in the short term to align electricity generation and consumption. Moreover, it reduces the curtailment of renewables by allowing consumption load to be shifted to high generation periods. With the gradual penetration of smart meters and smart plugs and the popularity of mobile apps, the share of demand response and other flexibility measures will continue to grow in the future electricity grid; this is especially true with the growth of net-zero pledges.

Reference: [1]. Binyet et al.

2. Flexible plate in the wake of a square cylinder for energy harvesting

Flexible piezoelectric plates can be placed in oscillatory wakes to generate electricity from the resulting vibrations. In the case of a square cylinder, flow detaches from the leading edges and alternating vortices are shed in a staggered fashion in the wake. The resulting travelling pressure wave on the plate's surface can trigger different plate deformation patterns according to parameters such as Reynolds number, square diameter, plate stiffness, width and length. Fluid flow and plate deformation were simultaneously measured using Particle Image Velocimetry in a water tunnel and the Fluid-Structure Interaction phenomenon was modelled using computational fluid dynamics coupled to computational solid dynamics. Significant plate-wake interaction of longer plates results in greater strain energy. However, at the same time, significant charge cancellation could occur in the piezoelectric cells due to position shifts of the strain nodes.

Reference: [2-3, 5]. Binyet et al. 2020.

REPRESENTATIVE PUBLICATIONS (*: corresponding author)

1. Binyet, E.; Chiu, M.-C.; Hsu, H.-W.; Lee, M.-Y.; Wen, C.-Y. Potential of Demand Response for Power Reallocation, a Literature Review. Energies 2022, 15, 863.
2. Binyet, E.; Chang, J. Y.*; Huang, C. Y., "Flexible plate in the wake of a square cylinder for piezoelectric energy harvesting – parametric study using Fluid-Structure Interaction modeling", *energies,* 2020, 13(10), 2645
3. Binyet, E.; Huang, C. Y.; Chang, J. Y.*, "Water Tunnel Study of a Cantilever Flexible Plate in the Wake of a Square Cylinder" *Microsystem Technologies*, 2020

4. Binyet, E.; Chang, J.Y.*, “Magnetohydrodynamics Modelling of a Permanent Magnets Activated MRF Clutch-brake”, *Microsystem Technologies,* 2020
5. Binyet, E.; Huang, C. Y.; Chang, J. Y.*, “Characterization of a vortex-induced vibrating thin plate energy harvester with particle image velocimetry”, *Microsystem Technologies*, 2018, 24, 4569-4576.
6. Camara, N.; Xu, D.*; Binyet, E. “Enhancing household energy consumption: How should it be done?” *Renewable and Sustainable Energy Reviews*, 2018, 81, 669-681
7. Camara, N.; Xu, D.*; Binyet, E. “Understanding household energy use, decision making and behaviour in Guinea-Conakry by applying behavioural economics.” *Renewable and Sustainable Energy Reviews*, 2017, 79, 1380-1391
8. Binyet, E.*, and Wang, J. "Numerical Study of a Six-Bladed Savonius Wind Turbine." *ASME. J. Sol. Energy Eng*., 2011; 133(4): 044503.