

XJTLU-XJTU-UoL Joint Doctoral Supervision Project (Full-time)

Reference No.	SFXJTU2503
XJTLU School	School of Advanced Technology
PhD Programme	Electrical and Electronic Engineering
Supervisors	XJTLU supervisor: Dr Qinglei Bu XJTU supervisor: Professor Peng Kou UoL supervisor: Professor Joseph Yan
Project Title	Coordinated Wind Farm and Energy Storage Control for Frequency Support Considering Nonlinear Power Constraints 考虑非线性功率约束的风机储能协同调频控制
Application Deadline	Open until the position is filled

Requirements:

A UK first-class or upper second-class honours Bachelor's degree and a UK Master's degree with Merit (or their equivalent) are required for PhD admissions. Exceptional candidates holding only a Bachelor's degree may be considered on an individual basis.

Evidence of good spoken and written English is essential. The candidate should have an IELTS (or equivalent) score of 6.5 or above, if the first language is not English.

For more information about entry requirements and admission procedures of PhD programme at XJTLU, please visit:

[Entry Requirement - Xi'an Jiaotong-Liverpool University](#)

[How to Apply - Xi'an Jiaotong-Liverpool University](#)

Programme Structure:

Doctoral students in the joint programme are registered with both XJTLU and the UoL. Upon successful completion of the programme, the students will be awarded a PhD degree from University of Liverpool.

During their doctoral studies at XJTLU, students are expected to conduct research at XJTU as visiting students. Additionally, students have the opportunity to apply for a three to six-month research visit to UoL.

Project Description:

As the wind penetration rate in power systems continues to increase, its randomness and volatility pose significant challenges to grid stability. Energy storage systems, as an effective

complement to wind power, can rapidly adjust power output and help mitigate wind power fluctuations. However, the power response of wind turbines and energy storage systems in coordinated frequency regulation is constrained by nonlinear characteristics, complicating the design of control strategies.

This study focuses on the issue of nonlinear power constraints in wind turbine-energy storage coordinated frequency regulation, aiming to address key scientific problems such as modeling the nonlinear power characteristics of wind turbines and energy storage systems, designing coordinated control strategies that account for nonlinearities, and optimizing dispatch methods. The research includes developing dynamic models for wind turbines and energy storage systems, analyzing the impact of nonlinear power constraints on frequency regulation performance, designing coordinated frequency regulation strategies based on nonlinear predictive control to achieve dynamic power allocation and rapid response, and validating the proposed methods through simulations. The expected outcomes will enrich the theory of wind power-energy storage coordinated frequency regulation, enhance the stability of wind power grid integration, and provide theoretical and technical support for grid operation with high renewable energy penetration.

Joint Supervisory Team:

XJTLU supervisor: [Dr Qinglei Bu](#)

XJTU supervisor: [Professor Peng Kou](#)

UoL supervisor: [Professor Joseph Yan](#)

How to Apply:

Interested applicants are advised to email Professor Peng Kou (koupeng@mail.xjtu.edu.cn), and cc Dr Qinglei Bu (Qinglei.Bu02@xjtlu.edu.cn) the following documents for initial review and assessment (please put the project title in the subject line).

- CV
- Two formal reference letters
- Personal statement outlining your interest in the position
- Certificates of English language qualifications (IELTS or equivalent)
- Full academic transcripts in both Chinese and English (for international students, only the English version is required)
- Verified certificates of education qualifications in both Chinese and English (for international students, only the English version is required)
- PDF copy of Master Degree dissertation (or an equivalent writing sample) and examiners reports available