THE FARADAY INSTITUTION Modelling

MULTI-SCALE MODELLING

Performance and sustainability trade-offs of different battery chemistries in commercial EVs.

Project Description

Since the currently dominant LIB chemistry NMC is associated with high environmental impacts due to the use of Ni and Co, the current research trend goes towards exploring alternative more sustainable battery chemistries. $LiFePO_4$ (LFP), which uses abundant materials such as Fe, has been often disregarded due to its lower energy density compared to NMC chemistries. However, it has recently gained in momentum as Tesla announced to implement LFP in its cars. On a kWh basis, LFP and NMC have similar overall environmental impacts. However, the performance and lifetime of a battery during the EV use phase can make a significant impact on the life cycle environmental footprint. We therefore want to assess in detail the cycling performance of LFP vs. NMC in commercial EV battery packs under various driving cycles and model the associated environmental impact of the manufacturing and use phase.

Project Objectives

- Extract performance, environmental impact and cost data for different battery chemistries from literature.
- Analyse commercial battery pack designs from A2Mac1 database.
- Implement data in techno-economic models for cost and environmental impact assessment.
- Draw comparisons and conclusions from the data.

Learning Objectives

- Understanding of the working principle of batteries and applications
- Obtaining insights into the battery value chain, associated challenges and key solutions
- Development of techno-economic models tailored towards engineering problems

Funding

A salary of £9.50/hour across the UK or £10.85/hour in London will be provided. This will be determined by the working address of the appointee, not the university's location. The internship is a full-time role for 8 weeks beginning in June-early July. The funding is provided by The Faraday Institution.

Eligibility

In order to be eligible for the Faraday Institution's FUSE funding, you will need to:

- Be a fully registered student at a UK university; and
- Not be in your final year of undergraduate study.

This project can be executed entirely remotely.

To apply:

Please send your CV and a brief cover letter to j.edge@imperial.ac.uk and llander@ic.ac.uk by **30th April 2021**.

The criteria for selection will be:

Essential: a clear rationale for applying for the position and how it fits with the candidate's career goals.

Essential: evidence of interest and motivation for the research area.

Essential: familiarity with Excel spreadsheets.

Essential: ability to document work done and flexibility to discuss slides on ongoing results of the project with the supervisor weekly and update the supervisor promptly on any challenges faced.

Desirable: some experience in a high level programming language, preferably Python or MATLAB.

Imperial College London is committed to providing a supportive and considerate community, based on diversity, mutual respect and a commitment to excellence. Imperial College London was a founder member of the Athena Swan Charter, which recognises and celebrates good employment practice undertaken to address gender equality in higher education and research. Imperial College London received the institutional Silver award in 2012 and the Department of Mechanical Engineering at Imperial College London was recently awarded an Athena Swan Bronze Award.