



BU MATCH FUNDED STUDENTSHIPS 2024

PROJECT DESCRIPTION

PROJECT TITLE

Design and development of a new tidal energy station in Poole Harbour to utilise potential energy available within this natural resource.

PROJECT SUMMARY

To create a new tidal energy station in Poole Harbour by utilising potential energy available within this natural resource. The project is designed to have a minimal impact on the surrounding environment, be scalable and readily deployable and, at a minimum, provide a sustainable capacity of up to 150kWh. The generated and captured energy would initially be for use by Cosmetic Warriors / Lush Cosmetics.

Objectives

- Identify a site suitable for efficient tidal energy capture within Poole Harbour.
- Gather support, permissions & licencing from local authorities - BCP Council, Poole Harbour Commission, Crown Estate, Environment Agency.
- Demonstrate that renewable electricity does not have to be an eyesore and can complement the natural environment.
- Gain a comprehensive understanding of turbine design and efficient off-grid energy storage, construction and installation.
- Deliver a robust, scalable, technological solution that can be replicated at additional sites.

In order to deliver the most efficient energy capture and storage with the lowest environmental impact, the solution is required to be as efficient as possible (in terms of systemic loss). This will require the specialist application of materials including, but not limited to, nano coating as well as storage innovation for effective storage and discharge of captured energy. The project will also set a standard that others can build upon and learn from.

ACADEMIC IMPACT

Renewable energy research at NanoCorr, Energy & Modelling (NCEM) group (previously SDRC) has developed state-of-the-art Large Scale Flat Plate Solar Collector (LSFPSC) system integrated with novel thermo-fluid and Thermal Energy Storage design for clean, low-cost power and heat generation using solar radiation. This technology is now exploited and commercialised by at least one start-up company (The future Energy Source ltd) with annual revenue of around £1 million, and has led to reduced CO2 emissions, better LSFPSC system management and improved heat recovery. Furthermore, a statement submitted by Future Energy Source ltd suggests it has achieved a 20 % reduction in CO2 emissions and a 47 % reduction in customers' fuel bills. Future Energy Source ltd has fully commercialised the LSFPSC system with a per unit sale price of £365/unit, the cheapest and relatively most efficient amongst its competitor companies.

This proposed work in tidal energy has been a key priority for local stakeholders within Poole Harbour. Professor Khan's work with [Pool Tidal Energy Partnership](#) as one the founding Directors, will achieve [significant socio-economic and environmental impacts](#) [[Media Presence](#)].

This multidisciplinary approach will generate new knowledge in interfacing mechanistic design with numerical and computational flow dynamics, and deliver a robust design solution that will benefit wider communities and other applications.

SOCIETAL IMPACT

The research and its interdisciplinary nature have the potential to make a significant difference to society as it presents a solution to one of the biggest challenges now facing us – how to meet our current and future energy needs. With our current levels of consumption and the non-renewable sources we are using, our energy sources won't last forever. If we look to the future, our energy reserves used at our current rates will last us another 50 – 60 years for oil and gas, and

coal another 100 years. The LSFPS system was especially developed to address this challenge, keeping in consideration all such issues, and to overcome such challenges by providing a standalone system for clean, low-cost power and heat generation system using solar radiation. Existing state of the art technological solutions at NCEM will enable new multidisciplinary approaches to deliver clean energy capture, conversion and efficiency system.

Benefits to the Local Community

1. Educational Opportunities: The project could serve as an educational tool. We currently engage with local schools and communities to teach them about our practices. This could well be part of that toolkit for local STEM programs in schools and universities. They can collaborate with Lush to provide educational programs and workshops, fostering interest in renewable energy and sustainability among students.
2. Community Engagement: Lush will engage with the local community through awareness campaigns, workshops, and events, educating residents about tidal energy and encouraging sustainable practices. This engagement fosters a sense of environmental responsibility among the local population. This is complementary to, and builds on, their existing engagement through their [Green Hub](#). Infrastructure Development: The implementation of tidal energy projects may require the development or improvement of local infrastructure. This development can enhance the overall infrastructure of the region.
3. Energy Security: By relying on a local, renewable energy source, the community becomes less dependent on external sources of energy, enhancing energy security for the region. In 2019, a mere 5% of the energy demand of Dorset was produced by low carbon sources within the county itself ([source](#)).

Benefits to the Environment

1. Reduced Carbon Emissions: Tidal energy is a clean and renewable energy source. By using tidal energy, Lush would significantly reduce its carbon emissions, contributing to the fight against climate change and improving air quality in the region.
2. Biodiversity Preservation: Unlike fossil fuel-based power plants, tidal energy projects have minimal impact on local ecosystems. Preserving the delicate marine ecosystems in the Dorset area supports biodiversity and protects the region's natural heritage.
3. Climate Change Mitigation: The reduction in carbon emissions aligns with global efforts to mitigate climate change. By setting an example, Lush inspires other businesses and communities to transition to renewable energy sources, further amplifying the positive impact.
4. Preservation of Natural Resources: By using tidal energy, Lush reduces its demand and reliance on fossil fuels. This is particularly prevalent as it will be within sight of the Perenco 'off-shore' oil drilling site.

By using tidal energy for its operations in Dorset, we feel this would create a positive ripple effect. It would not only benefit the company but also uplift the local community, enhance environmental sustainability, and contribute significantly to our transition towards clean and renewable energy sources.

PGR DEVELOPMENT OPPORTUNITIES

BU provides excellent opportunities for personal and professional development through the Graduate School. There are various training opportunities available on campus. BU holds PGR seminars which provide excellent opportunities of showcasing research outcomes, networking and initiating new links.

Both the Department and the NanoCorr, Energy & Modelling (NCEM) research group, has state of the art research facilities and resources in solar thermal simulation, heat transfer, fluid mechanics and heat exchangers. NCEM has advanced experimental resources which also analytical tools. The student will receive training on relevant bench testing.

The PGR will receive supervision from an experienced Academic Supervisor and the Company Supervisor. This will include meetings and sprint planning meetings, supplemented - as required - by other forms of communications. PGR will also have access to the named Company Supervisor located at the business premises, and will be integrated into the core development team to enhance the two-way exchange of knowledge.

SUPERVISORY TEAM	
First Supervisor	Professor Zulfiqar Khan
Additional Supervisors	Dr Adil Saeed, Adam Goswell (industry advisor)
Recent publications by supervisors relevant to this project	A list of publications can be found here .

INFORMAL ENQUIRIES
Please contact the lead supervisor on the following email for informal enquiries: zkhan@bournemouth.ac.uk
ELIGIBILITY CRITERIA
<p>The BU PhD and MRes Studentships are open to UK, EU and International students.</p> <p>Candidates for a PhD Studentship should demonstrate outstanding qualities and be motivated to complete a PhD in 4 years and must demonstrate:</p> <ul style="list-style-type: none"> outstanding academic potential as measured normally by either a 1st class honours degree (or equivalent Grade Point Average (GPA) or a Master's degree with distinction or equivalent. an IELTS (Academic) score of 6.5 minimum (with a minimum 6.0 in each component, or equivalent) for candidates for whom English is not their first language and this must be evidenced at point of application. <p>Candidates for an MRes Studentship should demonstrate outstanding qualities and be motivated to complete a MRes in 18 months and must demonstrate:</p> <ul style="list-style-type: none"> outstanding academic potential as measured normally by an upper second class honours degree (or equivalent Grade Point Average (GPA) an IELTS (Academic) score of 6.5 minimum (with a minimum 6.0 in each component, or equivalent) for candidates for whom English is not their first language and this must be evidenced at point of application.
HOW TO APPLY
<p>Please complete the online application form by the deadline on the project webpage.</p> <p>Further information on the application process can be found at: www.bournemouth.ac.uk/studentships</p>