CO(L)LABORATORY

2025 PhD Studentships

Scalable Virtual Power Plants: Supporting community energy systems in Nottinghamshire through innovation

About the Project

Nottinghamshire, like many regions in the UK, is facing rising energy costs and a reliance on external energy providers, leaving communities with limited control over how they produce and use energy. Virtual Power Plants (VPPs) offer an innovative solution by connecting local renewable energy sources – such as wind turbines and solar panels – into an aggregated, coordinated system that can balance energy supply and demand. This project will explore the adoption of VPPs for rural communities and their integration into the wider rural landscape especially with a focus on food production.

The community partners for this project are Sustainable Hockerton and the Hockerton Housing Project. These organisations are pioneers of community-owned and operated wind turbines and solar panels, and are currently developing one of the UKs first community owned agri-voltaic systems, which present an exciting opportunity for producing energy and food on the same land. The project will develop a scalable model for integrating locally distributed energy sources into a VPP for Hockerton and wider Nottinghamshire communities, and explore how energy production can be integrated with the wider rural landscape especially with a focus on food production.

The research will engage with local community energy initiatives across Nottinghamshire, ensuring that the project reflects the diverse energy needs and priorities of the region. This engagement will help share knowledge and best practices, making the findings relevant to a wide range of local stakeholders.

Further, this research will evaluate the social, environmental, and economic potential of VPPs while also investigating the regulatory frameworks needed to support their wider adoption. This project offers Nottinghamshire the chance to be at the forefront of cutting-edge energy and food solutions. The findings will provide a roadmap for other communities to adopt bespoke VPPs, contributing to a more resilient, affordable, integrated, and sustainable energy system.

This project has been co-created and is supported by researchers from Nottingham Trent University (NTU), the University of Nottingham (UoN) and partners at Sustainable Hockerton and Hockerton Housing Project. The successful candidate for this project will be enrolled at Nottingham Trent University.

Project Aims

- To evaluate the feasibility and scalability of integrating Sustainable Hockerton's existing and planned renewable energy assets into a VPP that can also connect with the rural economy, with a focus on food production.
- To develop a scalable VPP model that addresses the technical, economic, environmental and social needs of Nottinghamshire's communities, supporting cost reduction, energy and food security, and sustainability.
- To identify policy and regulatory frameworks that can enable the widespread adoption of community-based VPPs across the UK, overcoming existing barriers and leveraging lessons from successful local and international projects.

Supervisory Team

1. Lead Academic Supervisor: Dr. Tom Rogers (NTU)
2. Academic Co-Supervisor(s): Prof Yupeng Wu (UoN)
3. Community Supervisor(s): Simon Tilley (Hockerton Housing Project), Dr Geeta Lakshmi (Sustainable Hockerton)

Key Details

Host University	Nottingham Trent University
School / department	School of Science and Technology
Start date	01 April 2025
Financial offer	Tuition fees covered in full (worth approx. £15k across full PhD programme). Monthly stipend based on £19,237 per annum, pro rata, tax free.
Working hours	Full-time (minimum 37.5 hrs per week)
Working Style	Primarily in-person at host university. Flexible working supported. Working pattern to be agreed between successful candidate and lead supervisor.

Competencies

Co(l)laboratory Core Competencies		
Category	**Competency**	**Assessed: Application (A), Interview (I)**
Comprehension and evaluation	Strong understanding of the project and its subject matter.	A / I
	Analytical, researcher mindset with keen attention to detail.	A / I
	Communicate complex concepts with clarity and precision.	A / I
	Able to identify connections, patterns, gaps, and irregularities in information/data.	I
	Able to interpret data/information confidently with logic and empathy to derive meaning.	I
Social and emotional	Demonstrable experience of responding effectively changing contexts, information and demands.	A
	Ability to persevere in the face of challenges/failures and to remain constructive in developing solutions.	A
	Demonstrable passion for learning with clear drive and curiosity to undertake this specific research project.	A / I
	Willingness to immerse oneself in the research subject matter and make a contribute to new knowledge through a PhD.	A / I
	Strong desire to make a positive community impact through the research.	A / I
	Willingness to think deeply about complex concepts and engage with academic ideas and theory.	A / I
Preparedness and potential for success	Experience of working, collaborating and communicating effectively with different stakeholders.	A
	High level of self-motivation and ability to work with minimal guidance.	A / I
	Strong organisational and time-management skills with the ability to balance and prioritise multiple tasks.	A / I
	Ability to identify potential challenges and complexities and thoughtfully consider possible solutions.	A / I
	Able to identify the technical, personal, or professional skills required for a task and take action to develop these.	A / I
Community Context	Genuine desire to undertake community-engaged research over more traditional approaches to research.	A
	Understand the impact of and need for the inclusion of diverse experiences and points of view in research.	A / I
	Appreciation/understanding of the importance of community insight and experience in the generation of new knowledge.	A / I
	Awareness/understanding of the broader societal context related to the subject matter of the project.	A / I

Project Specific Competencies			
Essential	**Assessed: Application (A), Interview (I)**	**Desirable**	**Assessed: Application (A), Interview (I)**
Understanding of the socio-economic context and impact of renewable energy projects.	A / I	Experience with energy system analysis, modelling, or related technical work.	A / I
Experience with sustainability initiatives, community projects, or similar fields.	A / I	Practical experience in areas such as solar PV installation, farming, or community energy initiatives.	A / I
Experience with sustainability initiatives, community projects, or similar fields.	A / I	Knowledge of Virtual Power Plants, distributed energy systems, or similar concepts.	A / I
Knowledge of renewable energy systems, policy, or community energy projects.	A / I	Proficiency with digital tools and software for data analysis or project management.	A / I
Willingness to engage with local communities and stakeholders to understand their energy needs.	A / I	Proficiency with digital tools and software for data analysis or project management.	A / I

References for Further Reading

- CIGRÉ Canada (2020). Community Storage and Virtual Power Plants: The Next Steps in Decentralized Energy Systems. Available at: https://cigreconference.ca/papers/2020/C6/303/CIGRECanada2020-Community%20Storage%20VPPs.pdf (Accessed: 18 September 2024). [Provides insight into community-based VPPs and energy storage solutions.]
- Ness, G.C., Seetharaman, K. and Nunes, A. (2024). 'The role of energy storage and virtual power plants in decarbonising power systems', Energy, Sustainability and Society, 14(1), 483. Available at: https://doi.org/10.1186/s13705-024-00483-y (Accessed: 21 September 2024). [Examines how VPPs and energy storage contribute to decarbonisation.]
- National Renewable Energy Laboratory (NREL) (2024). Virtual Power Plants: Unlocking the Grid of the Future. Available at: https://www.nrel.gov/docs/fy24osti/86607.pdf (Accessed: 18 September 2024).[A detailed report on the role of VPPs in future energy grids.]
- Energy, Sustainability and Society (n.d.). Virtual power plants: An in-depth analysis of their advancements and importance as crucial players in modern power systems. Available at: https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-024-00483-y (Accessed: 18 September 2024). [A comprehensive analysis of VPPs and their importance in power systems.]
- Interreg Europe (2021). Virtual Power Plant. Available at: https://www.interregeurope.eu/good-practices/virtual-power-plant (Accessed: 21 September 2024). [Covers practical examples of VPP implementation across Europe.]
- Rocky Mountain Institute (RMI) (2024). Virtual Power Plants: Policy Principles for the Grid of the Future. Available at: https://rmi.org/wp-content/uploads/dlm_uploads/2024/02/vpp_policy_principles_updated.pdf (Accessed: 18 September 2024). [Focuses on the policy frameworks necessary for scaling VPPs.]
- European Commission (n.d.). Energy Communities. Available at: https://energy.ec.europa.eu/topics/markets-and-consumers/energy-consumers-and-prosumers/energy-communities_en (Accessed: 18 September 2024). [Explores the role of energy communities and their connection to VPPs.]
- Hockerton Housing Project (n.d.). Renewable Energy. Available at: https://www.hockertonhousingproject.org.uk/renewable-energy/ (Accessed: 18 September 2024). [Provides critical information on the subject of the case study, as well as practical insights into community-led renewable energy initiatives.]
- Ofgem (2015). Consultation Response: Virtual Power Plants. Available at: https://www.ofgem.gov.uk/sites/default/files/docs/2015/09/consultation_response_-_virtual_power_plants.pdf (Accessed: 18 September 2024). [A regulatory overview on VPPs in the UK.]
- ENTSO-E (n.d.). Virtual Power Plants. Available at: https://www.entsoe.eu/Technopedia/techsheets/virtual-power-plants (Accessed: 18 September 2024). [Technical guide on VPPs and their integration into existing energy systems.]