

## Research Associate in Building Energy Building Energy and Environment Data Analyst

Job Ref: REQ17724

**As part of the University's ongoing commitment to redeployment, please note that this vacancy may be withdrawn at any stage of the recruitment process if a suitable redeployee is identified.**

### **About the School of Architecture Building and Civil Engineering**

Research and teaching in the School of Architecture Building and Civil Engineering is driven by 63 academic staff, 34 technical and clerical support staff, 40 contract researchers and over 120 doctoral students. The School benefits by having academic staff from a wide variety of backgrounds, with a resulting rich diversity of perspectives.

In October 2017 the School will launch an architecture programme which will benefit from the technical capability of existing School staff and new design staff. The School will be renamed the School of Architecture, Building and Civil Engineering.

The undergraduate programmes include Civil Engineering, Construction Engineering Management, Commercial Management and Quantity Surveying, Architectural Engineering and Design Management, Air Transport Management, and Transport and Business Management.

At MRes level we train the next generation of multi-disciplinary researchers in energy demand. At MSc level, we offer programmes in Low Energy Building Services Engineering and Low Carbon Building Design as well as in Water and Waste Engineering, Construction Management, Transport Policy and Business Management. These programmes are all accredited by the Professional Institutions. The EPSRC Centre for Doctoral Training in Energy Demand will support over 50 PhD students.

In all courses the academic content is directly aligned to the needs of the industry and there is a high level of sponsorship in our portfolio of programmes. Our record of graduate employment is second to none and we have been ranked 1<sup>st</sup> or 2<sup>nd</sup> in the National Student Survey for the last 6 years.

Further information may be found from - <http://www.lboro.ac.uk/departments/civil-building/>

In the 2014 Research Excellence Framework, the School was ranked fifth in the Architecture and Built Environment Unit of Assessment with 87% of the work judged as either "world leading" or "internationally excellent". Importantly, this was achieved whilst still returning 100% of staff; world class research pervades the School. The research environment was ranked first overall; Loughborough is the best place in which to build a career in energy research.

The international standing of our research is exemplified by our growing portfolio of collaborations with other leading universities and research institutes worldwide. These include: the UNSW Sydney, University of California at Berkeley, MIT, Chongqing, Hong Kong, Iowa State, Oklahoma State, RMIT, Georgia State and Penn State.

We are equally proud of our collaborations with industry where we count organisations such as Willmott Dixon, Electricite de France, The BRE, Honeywell, Anglia Water and Biffa. Built Environment research is increasingly informing government policy through, for example, the Department for Business, Energy and Industrial Strategy and The Committee on Climate Change.

For more on our research go to: <http://www.lboro.ac.uk/schools/cv/research/index.html>

### **Built Environment Research: Lead the Way**

Built Environment research is one of Loughborough University's strengths, with world leading activity in a number of areas: building energy demand; indoor environments; and urban infrastructure. The activity is supported strategically and financially through the Built Environment Beacon, which is led by Prof Kevin Lomas. This core area of endeavour is pursued through research that spans from the fundamental to the highly applied and is conducted, as appropriate, through collaboration between academics from science, engineering, the social sciences and economics.

### **The Building Energy Research Group**

Energy research in the School has, for over 40 years, been led by the Building and Energy Research Group (BERG) which focusses in areas such as building energy efficiency, the impact of occupants on energy demand, energy systems integration, air quality, energy modelling at the urban and building scale, performance monitoring, and the impacts of climate change.

The BERG has expanded rapidly over recent years and now has 11 academic staff and 10 Research Associates (RAs) who, together with others, supervise around 40 PhD students. The Group has excellent laboratory facilities, access to full-scale test houses and thousands of sensors and meters that enable large-scale field trials in domestic and non-domestic buildings. The Group has an archive of monitored data from close to 1000 UK homes, the analysis of which can provide new insights in to the relationship between dwelling construction, the energy systems and occupancy.

New staff will join a research active, expanding, collegiate group, which is supported by an excellent research environment, and which has a strong and growing international reputation.

### **Building Energy and Environment Data**

The BERG has acquired, and is still gathering, data from hundreds of UK houses of which the data from the SCENe project and the DEFACTO project are especially relevant. These data underpin collaborative projects with UK and overseas academics, such as the work of International Energy Agency Annex 71 'Building Energy Performance Assessment Based on In-situ Measurements'.

The Smart Community Energy Network (SCENe) project seeks to accelerate the adoption of Community Energy Systems (CES). These are systems that generate and supply heat and electricity to homes and commercial buildings locally: the energy is produced, stored and used within the community with minimal or no use of the national grid. The new housing development in Nottingham's Trent Basin consists of c50 homes that are supplied with electricity from photovoltaic panels linked to Europe's largest battery. A heat network with thermal storage provides space heating and hot water. This project is founded on a strong partnership of world-leading companies and academics.

The Loughborough research team are creating a model of the Trent Basin development that will predict the likely space heating and hot water demands of the community. The model will assist organisations to design and manage CESs, in particular the charging and discharging of thermal stores and the sequencing of heat raising plant. Energy demand and other data will be collected from the homes in the development by Nottingham University researchers. This data will enable the validation, and subsequent refinement, of the thermal energy model.

When fully operational, the Trent Basin homes will provide a flow of data that will enable empirical models of energy demand to be created. Such models could be continually refined so that the likely heating energy demand for the next day or two can be predicted. More generally, the ability to make such predictions for groups of existing homes would pave the way for better CES design and management in established urban areas. This is an area that is of interest within IEA Annex 71. The data collected from c200 homes as part of the DEFACTO project would enable the exploration of such a modelling approach and close collaboration with the European partners in Annex 71.

More generally, the collation, cleaning, organisation, analysis and custodianship of large datasets is a growing area of importance for the BERG so there is scope for further work in the general areas of model validation, grey and black box modelling and statistical analysis.

A Research Associate is sought who will make use of the data from the SCENe project to validate the Trent Basin thermal energy demand model and capitalise on the DEFACTO dataset to explore the potential of black box models for predicting future energy demand. The Research Associate will therefore have highly developed skills in relevant data analysis techniques and experience of working with large data sets.

## **Job Description: Building Energy and Environment Data Analyst**

### **Job Grade: Specialist and Supporting Academic Grade 6**

#### **Job Purpose**

The Research Associate will be responsible for the collation, cleaning, organisation, analysis and custodianship of large datasets that describe the energy demands of, and internal temperatures in UK homes and the use of these data for validating thermal models and developing predictive black-box models.

#### **Job Duties**

##### **Research**

- To organise and catalogue the data from the DEFACTO project such that it can be used by researchers at Loughborough and elsewhere to undertake detailed analysis.
- To distribute the data to international collaborators and help them to use of the data effectively.
- To explore, understand and become familiar with the different black-box and, possibly, grey-box models that are used within the building energy research community.
- To develop empirical models, based on existing data that can predict the likely future energy demands of one or more domestic buildings. To validate models by comparison with the actual measured energy demands.
- To take receipt of data from the Trent Basin homes and use it to validate a dynamic model of space heating and hot water energy demands.
- To contribute to developing and refining ethics, health and safety, and data protection processes.

##### **General, technical**

- To formulate detailed work plans based on broad guidance from Prof Lomas and Dr Allinson.
- To maintain a sound and up to date knowledge of research methods relevant to the post.
- To feed back to Prof Lomas and Dr Allinson on progress, to make recommendations for next steps and to prepare project reports.
- To support Loughborough project teams concerned with domestic energy and environment data, and its cleaning, organisation, analysis and custodianship.
- To enhance relationships with existing collaborators, especially those within the SCENe, DEFACTO and Annex 71 projects, and to establish new relationships with UK and overseas collaborators.
- To write project reports and research papers suitable for publication in high quality academic journals and for presentation at specialist scientific conferences.
- To attend and contribute to scientific conferences.
- To contribute to project promotion and public engagement events.

##### **Teaching**

- To assist the academic staff at Loughborough with the supervision of undergraduate, MSc and PhD project work and day-to-day supervision and support of other researchers.
- Where appropriate, to deliver lectures, tutorials and laboratory sessions to students.

##### **General and administrative**

- To work effectively with relevant administrative, technical and academic staff in the School and across the University.
- To represent the project and the University at UK and overseas events.
- To engage in training programmes in the University (e.g. through Staff Development) which are consistent with your needs and aspirations and those of the project team and the host School.
- To carry out specific other duties as may be reasonably requested by the project leaders and that are commensurate with the nature and grade of the post.

**Points to Note**

The purpose of this job description is to indicate the general level of duties and responsibility of the post. The detailed duties may vary from time to time without changing the general character or level of responsibility entailed.

**Special Conditions**

All staff have a statutory responsibility to take reasonable care of themselves, others and the environment and to prevent harm by their acts or omissions. All staff are therefore required to adhere to the University's Health, Safety and Environmental Policy & Procedures.

All staff should hold a duty and commitment to observing the University's Equality & Diversity policy and procedures at all times. Duties must be carried out in accordance with relevant Equality & Diversity legislation and University policies/procedures.

Successful completion of probation will be dependent on attendance at the University's mandatory courses which include Respecting Diversity and, where appropriate, Recruitment and Selection.

**Organisational Responsibility**

Reports to: Kevin Lomas and David Allinson

## Person Specification

Your application will be reviewed with respect to meeting the essential and desirable criteria listed below. Your application will be reviewed against the essential and desirable criteria listed below. Applicants are strongly advised to explicitly state and evidence how they meet each of the essential (and desirable) criteria in their application. Stages of assessment are as follows:

- 1 – Application
- 2 – Test/Assessment Centre/Presentation
- 3 – Interview

### Essential Criteria

Area	Criteria	Stage	
Experience	Background in engineering, science or mathematics.	1,2,3	
	Postgraduate research experience in a relevant field or equivalent industry expertise.		
	Experience of handling large datasets.	1,3	
	Experience of relevant numerical modelling techniques.	1,3	
	Research work in the area of buildings and energy demand.	1,3	
	Production of academic papers, technical reports and / or guidance materials on engineering or science topics.	1	
	Skills and abilities	Ability to undertake the duties and responsibilities of the post.	1,3
	Excellent programming skills including proven skills in programming languages such as Modelica, Python, MATLAB, C or Java.	1,2,3	
	Working knowledge of domestic energy systems and energy demand.	1,3	
	Excellent written and oral communication skills.	1,2	
	Self-motivated with ability to meet deadlines.	3	
	Ability to work independently and as part of a team.	3	
	Excellent interpersonal and organisational skills.	2,3	
	Training	Willingness to undertake appropriate further training and to adopt new procedures as and when required.	1
	Qualifications	A good educational profile up to and including first degree.	1
A PhD or near completion		1	
Other	Commitment to observing the University's Equal Opportunities policy at all times.	1,3	
	Willingness to travel overseas.	3	
	Commitment to maintain confidentiality at all times.	3	

### Desirable Criteria

Area	Criteria	Stage
Experience	Experience of validating dynamic thermal models of buildings.	1,3
	Experience of developing black-box models.	1,3
	Experience of developing grey-box models.	1,3

	Experience of the collation, cleaning, organisation, analysis and custodianship of large datasets.	1,2,3
	Teaching and / or supervision of students in relevant areas.	1,3
	Securing research and / or project funds from external / company sources.	1,2,3
	Experience of working in multi-national research projects.	1,3
Skills and abilities	Working knowledge of domestic energy demand profiles.	1,3
	Knowledge of dynamic thermal simulation models of buildings.	1,3
Other	Able and willing to work evenings away from the University.	3

## Conditions of Service

The position is full time and fixed term for 24 months. Salary will be within Specialist and Supporting Academic Grade 6 £29,301 to £37,075 per annum at a starting salary to be confirmed on offer of appointment. Subject to annual pay award.

The appointment will be subject to the University's normal Terms and Conditions of Employment for Academic and Related staff details of which can be found [here](#).

The University is committed to enabling staff to maintain a healthy work-home balance and has a number of family-friendly policies which are available at <http://www.lboro.ac.uk/services/hr/a-z/family-leave-policy-and-procedure---page.html>.

We also offer an on-campus nursery with subsidised places, subsidised places at local holiday clubs and a childcare voucher scheme (further details are available at: <http://www.lboro.ac.uk/services/hr/a-z/childcare-information---page.html>)

In addition, the University is supportive, wherever possible, of flexible working arrangements. We also strive to create a culture that supports equality and celebrates diversity throughout the campus. The University holds a Bronze Athena SWAN award which recognises the importance of support for women at all stages of their academic career. For further information on Athena SWAN see <http://www.lboro.ac.uk/services/hr/athena-swan/>

## Informal Enquiries

Informal enquiries should be made to Professor Kevin Lomas, Professor of Building Simulation, by email at [K.J.Lomas@lboro.ac.uk](mailto:K.J.Lomas@lboro.ac.uk) or by telephone on (01509) 222615 or Dr David Allinson, Lecturer in Building Physics: measurement and modelling, by email at [D.Allinson@lboro.ac.uk](mailto:D.Allinson@lboro.ac.uk) or by telephone on (01509) 223643.

## Applications

The closing date for receipt of applications is **5 September 2017**.