



Ysgoloriaethau Sgiliau Economi Gwybodaeth  
Knowledge Economy Skills Scholarships



**Project Title: KESS 2 PHD Scholarship:** An evaluation of retrofit measures for residential typologies in Wales to assess impacts upon energy performance, and occupant fuel poverty, thermal comfort and health and wellbeing

**Director of Studies:** Dr John Littlewood (Academic Lead Supervisor)  
**Project Team:** Professor George Karani (Academic Supervisor)  
Dr Jo Atkinson (Academic/Industrial Supervisor)  
Mr David Bolton (Lead Company Supervisor)  
Ms Alison Crawley (Company Supervisor)  
Professor Andrew Geens (Technical Adviser)  
Professor Trevor Mole – (Software/Technical Adviser)

**Project outline:**

This research sits within the fields of Architectural Technology and Environmental Public Health, measuring the impact upon occupants in existing dwellings that have undertaken retrofit improvement measures; building upon a successful KESS I project (Dr Atkinson, 2015). The PhD is led by Dr Littlewood the Head of the Ecological Built Environment (EBERE) group in Cardiff School of Art and Design (CSAD) and also Professor George Karani from Environmental Public Health in Cardiff School of Health Sciences (CSHS). Dr Atkinson provides supervisory input, as Housing Lead at the Carbon Trust. David Bolton leads the input and support from the industrial partner: Melin Homes. In addition, technical advice is also provided by staff from the Chartered Institution of Building Services Engineers and Property Tectonics.

The PhD aims to evaluate the impact of retrofit upgrades to existing dwellings from a number of traditional and non-traditional construction types built since 1940 in Wales' less-developed areas. The variables include: occupant behaviour; optimum construction details to reduce heating costs and carbon emissions; energy use and thermal comfort; heating costs and the impacts upon fuel poverty; and occupant health. This will lead to the development of key performance indicators to investigate how retrofit measures can contribute to the positive impact upon future generations.

Wales has seen two strategic energy performance funding programmes known as Arbed from 2010-2012 (Arbed I) and from 2012-2015 (Arbed II) targeting existing dwellings for retrofit energy efficiency upgrades. Addressing existing dwellings is needed because the majority of carbon emissions and fuel poverty issues in UK dwellings are from the existing stock. The UK, in particular Wales, has some of the most energy inefficient dwellings within Europe, resulting in significant fuel poverty and potential impacts upon occupant health.

There have been three completed studies that analysed the effectiveness of the retrofit measures from the Arbed I programme, but not yet of Arbed II, or any follow on large scale retrofit programmes. One of these studies is the successful KESS I PhD project, led by Cardiff Metropolitan University (2010 to 2015: completed by Dr Jo Atkinson). The KESS I project undertook the most detailed assessment of actual performance of Arbed I dwellings with desktop studies combined with on-site observations and testing; finding that although there was some alleviation from fuel poverty with greater thermal comfort, the expected reductions from fuel poverty were rarely met. However, none of the studies

assessed the impacts of building retrofit measures on occupant health, indoor air quality, or thermal comfort.

This PhD extends the learning from the previous three studies, and focusses on KPIs that benchmark: how to educate occupants so that they can influence their own health related to energy use and thermal comfort; identifying the most appropriate building fabric systems and heating and ventilation system upgrades to achieve energy and carbon savings, and also for fuel poverty alleviation. Subject to the commencement date, the proposed work is detailed here:

WP1: Literature review 01/17-12/19;  
WP2: Monitoring social and technical 02/17-01/18;  
WP3: Analysis and development of KPIs 04/17-08/18;  
WP4: Refining KPIs & Training 09/17-05/19;  
WP5 Thesis, Examination & Dissemination 06/19-12/19

Applicants must have a good first degree in a discipline such as Architecture, Architectural Technology or similar Building Design or Surveying, Building Services Engineering, or Scientific related areas. The project will involve visually assessing construction details (on paper and in-situ); testing the construction fabric of dwellings using a variety of methods, such as thermography tests, in-situ U measurements, air permeability tests; monitoring thermal comfort with sensors; engaging with occupants through interviews; and evaluating heating bills liaising with utility companies. So, knowledge of architectural science and physical monitoring of buildings; building design and construction details; building surveying; heating and ventilation systems; data analysis; and people skills are highly desirable. Ideally, applicants will also have a relevant Master's degree in a Sustainability, Architectural Design, Architectural Technology, Building Surveying or related Engineering or Science field. Some applied experience and good written and verbal communication skills in English and/or Welsh Language are essential. Data collection will be carried out within the operational areas of Melin Homes in and around Pontypool, and it is important that the student has a valid and current driving licence, issued by the UK or an EU country.

For more information please contact Dr John Littlewood on [jlittlewood@cardiffmet.ac.uk](mailto:jlittlewood@cardiffmet.ac.uk). The deadline for applications is 30/01/17.

### **Details of the scholarship**

The scholarship offers each eligible participant (student):

- A monthly stipend in line with RCUK rates: 3 years of funding @ £14,198 per year for PhD;
- KESS PhD Scholarship holders do not pay fees;
- Each scholarship has an additional budget for travel, conference attendance, minor equipment, consumables and training to support your research;
- Have an opportunity to access a suite of higher level skills training and attendance at a residential KESS Grad School;
- All participants must complete the KESS Postgraduate Skills Development Award
- A minimum of 30 days a year working with the company partner on their allocated project.
- Students must complete and submit their thesis in 3.5 years for PhD;
- Applicants should have UK or EU Citizenship, and be resident in the convergence area of Wales on appointment, and should have the right to work in the region on qualification. Residence will be evidenced by reference to documents such as driver's licence, tenancy agreement or recent statement from bank or building society.

## **CARDIFF MET KESS2 PROJECT**

- The map for the area that is eligible can be [found here](#). Please note the map also illustrates other assisted areas in the UK, however only the West Wales and the Valleys (in blue/grey: noted as 'a' areas) is eligible in this project

Supported by Knowledge Economy Skills Scholarships 2 (KESS2) which is an All Wales higher level skills initiative led by Bangor University on behalf of the HE sector in Wales. It is part funded by the Welsh Government's European Social Fund (ESF) convergence programme for West Wales and the Valleys.

Further Information regarding KESS2 project at Cardiff Met University can be [found here](#)

To discuss the project further contact: Dr John Littlewood:

E: [jlittlewood@cardiff.ac.uk](mailto:jlittlewood@cardiff.ac.uk)

T: +44 (0) 2920 41 66 76