

BUILT ENVIRONMENT RESEARCH INSTITUTE

ANNUAL REPORT

1 AUGUST 2016 - 31 JULY 2017



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1. Foreword: Research Institute Director Professor Stanley McGreal

In presenting the Annual Report for the Built Environment Research Institute (BERI) for the academic year 2016-2017, I am happy to report a very successful year for our research activities, with many new and prestigious research grants funded amounting to circa £6M and twelve of our PhD cohort graduating having successfully completed their doctoral thesis. Staff have been highly prolific in publishing world-leading scientific papers in key journals within their discipline areas, presenting at conferences, seminars and workshops internationally as well as disseminating the outcome of their reach to local audiences in Northern Ireland.

This foreword briefly reviews some of the activities of the five research centres within BERI: the Centre for Sustainable Technologies (CST), the Fire Safety Engineering Research and Technology Centre (FireSERT), the Hydrogen Safety Engineering and Research Centre (HySAFER), the Centre for Research on Property and Planning (RPP) and Studies Allied to Built Environment Research (SABER). The main sections of the report provide details of academic and research staff in the Research Institute, details of PhD projects and graduating PhDs, publications and information on our current research portfolio. Given the diversity of this research base, BERI's activities embrace many different constituencies, audiences and networks with users and beneficiaries embracing policy-makers, companies, the business sector and the wider community.

The Centre for Sustainable Technologies has continued to secure several successful grant applications including the Senergy Demonstrator generating new solar energy concepts, CHESS-SETUP delivering heat pumps for thermal energy storage, 4S-DHW delivering high efficiency hot water heat pumps and EENSULATE

(with FireSERT) which will deliver high efficiency structural glazing. Over the year, there has been a strengthening of CST's energy storage and demand side management research through funding received through the Science Foundation Ireland Investigators Programme with the Department for Economy NI and SPIRE 2 (INTERREG VA), projects that will address regional and national large-scale renewable energy integration and the need for electricity network stability.

In FireSERT, a new Fusion project was funded to develop inflatable structures for airplanes/airports and an EU project (TRAFIR) Travelling fires which aims to define the conditions in which travelling fire develops. The RFCS LOCAFI project received additional funding (LOCAFI+) from CEC - Coal and Steel for research into the design of steel columns subjected to localised fires. A new collaborative agreement with Angers University (France) was established and a partnership between FireSERT and Efectis France has commenced. Several members of FireSERT staff participated in the International Association of Fire Safety Science (IAFSS, Lund, 12-16 June) and the International Fire Safety Symposium (IFireSS, Naples, 7-9 June). FireSERT is pleased to host the 10th International Conference on Structures in Fire (SIF18) in 2018.

During 2016-2017 HySAFER completed two important European projects namely the European hydrogen emergency response training programme for first responders (www.hyresponse.eu) and the European Model Evaluation Protocol to support safety analysis of hydrogen and fuel cell technologies (<https://iaikit-sp2.iai.kit.edu/susana>). HySAFER continues to champion hydrogen safety research and education in UK through three EPSRC projects: SUPERGEN H2FC Hub (www.h2fcsupergen.com), SUPERGEN H2FC

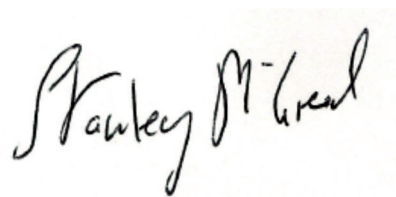
Challenge and EPSRC Centre for Doctoral Training in Fuel Cells and their fuels. HySAFER hosted the annual SUPERGEN Hub Researcher Conference in Belfast in December 2016, an event co-organised with Imperial College. New projects funded include the H2020 FCH JU, NET-Tools: Novel education and training tools based on digital applications related to hydrogen and fuel cell technology, INTERREG funding of €250,000 for 'Atlantic Network for Renewable Generation and Supply of Hydrogen to promote High Energy Efficiency' duration 2017-2020 and Invest NI PoC: Composite tank prototype for on-board compressed hydrogen storage. HySAFER continued its collaboration with Shell through the FP6 GENFUEL project.

RPP is pleased to be part of a major new initiative in housing, the UK Collaborative Centre for Housing Evidence (CaCHE) funded through the Economic and Social Research Council, the Arts and Humanities Research Council and the Joseph Rowntree Foundation. Led by the University of Glasgow, CaCHE is a collaboration between nine UK Universities and four non-HEI organisations and will have staff located at 5 hubs across the UK in Glasgow, Sheffield, London, Cardiff and Belfast. Other significant new awards in RPP include CEC H2020 for an Analysis System for Gathered Data (ASGARD), from the Royal Institution of Chartered Surveyors for research into private investment in infrastructure projects and the European

Real Estate Association for a project separating sector performance and company-specific performance for listed real estate.

SABER has a focus on research in construction and civil engineering. As a relatively new research centre, activities have focused upon staff attending international research conferences and developing networks in areas as diverse as geopolymers, highways, hydraulics, health and safety and roadside ecology. New funding was received for a KTP project with Rapid International Ltd.

The above provides a short summary of some of the main achievements in built environment research at Ulster over the year 2016-2017. Further details can be found on the BERI website <https://www.ulster.ac.uk/research/institutes/built-environment> or by contacting Mrs Sadie Magee (Admin Support) at (028) 90368638.

A handwritten signature in black ink, reading 'Stanley McGreal', is centered on a light-colored rectangular background.

Professor Stanley McGreal
Director Built Environment Research Institute

2. Research Institute: Academic Staff Members status at 31 July 2017

Surname	Forename	Title	Position	Institute Status
Adair	Alastair	Prof	Deputy Vice-Chancellor	Core
Ali	Faris	Prof	Professor of Structural Engineering	Core
Anderson	Mark	Mr	Lecturer	Associate
Berry	James	Prof	Professor of Global Real Estate & Planning Strategy	Core
Blair	Neale	Dr	Senior Lecturer	Core
Boyce	Karen	Dr	Senior Lecturer	Core
Brandoni	Caterina	Dr	Lecturer	Core
Brennan	Sile	Dr	Lecturer	Core
Choi	Seng-Kwan	Dr	Reader	Core
Davis	Peadar	Dr	Senior Lecturer	Core
Davison	Karen	Dr	Lecturer	Associate
Eadie	Robert	Dr	Lecturer	Associate
Golden	Saul	Dr	Lecturer	Associate
Griffiths	Philip	Prof	Head, School of the Built Environment	Core
Haran	Martin	Prof	Professor of Real Estate & Urban Studies	Core
Hemphill	Lesley	Dr	Lecturer	Associate
Hewitt	Neil	Prof	Professor of Energy/Director of CST	Core
Huang	Ming Jun	Dr	Reader	Core
Huang	Ye	Dr	Reader	Core
Hyde	Trevor	Dr	Reader	Core
Keenan	Michaela	Dr	Associate Dean (Education)	Associate
Lim	Lay-Cheng	Dr	Senior Lecturer	Core
MacIntyre	Sean	Mr	Senior Lecturer	Associate
Magee	Bryan	Dr	Lecturer	Associate
Mahon	Clare	Ms	Lecturer	Associate
Makarov	Dmitriy	Dr	Reader	Core
McAleenan	Ciaran	Dr	Lecturer	Associate
McConnell	Nigel	Dr	Lecturer	Associate
McCord	Michael	Dr	Reader	Core
McElduff	Linda	Dr	Lecturer	Associate
McGreal	Stanley	Prof	Professor of Property Research/Director of BERI and RPP	Core

Surname	Forename	Title	Position	Institute Status
Millar	Phillip	Dr	Lecturer	Associate
Molkov	Vladimir	Prof	Professor of Fire Safety Science/Director of HySAFER	Core
Mondol	Jayanta	Dr	Senior Lecturer	Core
Murphy	Martina	Dr	Lecturer	Associate
Nadjai	Ali	Prof	Professor of Fire Structural Engineering/ Director of FireSERT	Core
Rafferty	Gavan	Mr	Lecturer	Associate
Ritchie	Heather	Dr	Lecturer	Associate
Smyth	Mervyn	Dr	Reader	Core
Solan	Brian	Dr	Lecturer	Associate
Van der Krabben	Erwin	Prof	Professor of Real Estate	Core
Woodward	David	Dr	Reader/Director of SABER	Associate
Zacharopoulos	Aggelos	Dr	Lecturer	Core
Zhang	Jianping	Dr	Reader	Core

3. Research Institute: Research Staff Members status at 31 July 2017

Surname	Forename	Title	Position	Research Centre
Arya	Farid	Dr	Research Associate	CST
Asimakopoulou	Eleni	Dr	Research Associate	FireSERT
Colclough	Shane	Dr	Research Fellow	CST
Dadashzadeh	Mohammad	Dr	Research Associate	HySAFER
de Priall	Oisin	Dr	Research Associate	CST
Devlin	Steven	Mr	Research Fellow	CST
Fateh	Talal	Dr	Research Associate	FireSERT
Hinch	Martin	Dr	Research Associate	RPP
Kashkarov	Sergii	Dr	Research Associate	HySAFER
Keatley	Patrick	Dr	Research Fellow	CST
Pugsley	Adrian	Dr	Research Associate	CST
Rolfe	Angela	Miss	Research Associate	CST
Shah	Nikhilkumar	Dr	Research Associate	CST
Shentsov	Volodymyr	Dr	Research Associate	HySAFER
Vorushylo	Inna	Dr	Research Associate	CST

4. Research Students

The following research students were registered on research degree programmes in the Institute during 2016-2017.

Student Name	Thesis Title
Adams, William	Stakeholder Management of large scale infrastructure projects
Alam, Naveed	Fire performance of FRP in reinforced concrete slabs
Allen, David	Innovative approaches to understanding business location factors
Atefi Aghayan, Hooman	Developing a numerical method for simulating intumescent materials in fire
Alyward, Clare	Accessibility of the built environment and its effects on an increasingly ageing population
Ballentine, Mark	Emergency planning and resilience theme: 'countering unmanned aerial vehicles'
Benkorichi, Salah	Localised Experimental and Analysis of Compartment fire tests using pool fires
Benson, Jordan	Resilient relationships: an investigation into the nexus between spatial planning and community planning
Bhutta, Rumeel	Personal protective equipment for accidentally high risk circumstances under extreme conditions
Bidanset, Paul Edward	Decomposing the effect of foreclosure: using locally weighted regression with spatial, temporal and attribute weighting functions to understand the externalities of foreclosed single-family homes
Biglarbeigi, Pardis	Discovering the operating policies of a reservoir system considering the impact of climate change
Bogle, Gary	A cost versus benefit analysis of delay and disruption techniques in the risk management of construction projects
Bradley, Philip	A carbon valuation model for commercial buildings in a market downturn
Byrne, Raymond	Evaluation of energy storage with wind auto-production at an industrial site connected to the distribution grid
Casey, Thomas	Friction after polishing: A probabilistic framework for improved roads management on national roads in Ireland
Cassidy, Peter	Design and evaluation of community fire safety educational programmes
Chakroborti, Shauli	Design, development and experimental characterisation of an innovative solar building wall with thermal storage and heat transfer characteristics
Chotzoglou, Konstantinos	External flames on façade fires
Cirrone, Donatella MC	Hazards from catastrophic failure of high-pressure hydrogen storage
Clarke, SORCHA	Shaping resilient places and communities: Exploring expressions of planning theory and practice
Coon, David	The interrelationship between noise and the physical well-being of inhabitants adjacent to major infrastructure such as transportation routes

Student Name	Thesis Title
Crinion, Kate	Disaster recovery and reconstruction: harnessing capacity and improving resilience within affected communities
Cunningham, Gervase A	Business development and innovation in construction companies
Delargy, Bronagh	An examination of the adverse associations between housing circumstances and mental health in Northern Ireland
Donaghy, Leona	Optimum integration of a range of energy efficient and renewable energy technologies under real conditions in occupied test homes
Donkoh, Emmanuel	Improving project performance: Application of system dynamics modelling in managing construction stakeholders. Influences and challenges?
Dou, Mengmeng	Real estate valuation practice in China - An emerging market perspective Eghbalighazijahani, Amir Governance and planning policies to increase the resilience of urban areas to climate change
Fadeyi, Olawumi	Capital and real estate markets in global financial cities
Firth, Simona	Vacuum window performance evaluation and characterisation
Frey, Joe	Changing patterns of migration, labour markets and the growing demand for privately rented dwelling in Northern Ireland - the implications for planning and housing
Fumey, Benjamin	Absorption based heat storage with NaOH, heat and mass exchanger development and system integration
Gallagher, Louise	Understanding movement parameters for mixed ability populations
Hall, Leaine Martine	Integrated constructed wetlands: performance and analysis
Hamil, Mark	Development of innovative management strategies to address proliferation of littering in the built environment
Hawe, Owen	Cross-community urbanism – How ‘new urbanism’ has a place in contested cities
Hossen, Ali Mahmood	Climate change and transport disruption: measuring risk and uncertainty
Hussein, Harem	Pressure peaking phenomenon for hydrogen jet fires
Isirima, Michael KE	Fire protection risk assessment: a study of offshore installations
Lawson, Aaron	New tools to investigate the role of simple hygiene measures in communicable disease prevention, namely hand-washing practices
Le, Khoa	A proposal for control of domestic heat pumps with smart grid
Lim, Ohk Kun	Structural performance of shear fire
Lockhart, Danielle SE	An assessment of the impacts of air quality on public health within Northern Ireland
MacDonald, Colin M	Law enforcement perspectives on lone actor terrorism
Mahon, Clare	To develop an economic operator prequalification model to assist in the award of public contracts
Mahone, Nedra	Economic base and the impact on real estate returns
McAleenan, Aoife	Using Irish road infrastructure as a means of connecting essential pollinator habitat corridors
McAllister, Anthony	Human behaviour in fire and emergencies
McErlane, Andrew	A risk allocation model for public private partnerships
McKane, Mark	The contributions of Building Information Modelling (BIM) to improved Construction Industry performance in Northern Ireland
McKinstry, Colin	Development and validation testing of an advanced domestic air source heat pump

Student Name	Thesis Title
McMenamin, Deirdre V	Developing cultural-spatial representation of the interrelationship between landscape and human agency in rural Ireland/Northern Ireland: revealing the agency of landscape strategy in Irish vernacular architecture
Muhumuza, Ronald	Clean power production with concentrating solar power (CSP) technology: development of a solar thermal energy device for latent heat storage (LHS) from cost-effective, abundant and safe materials
Nowlan, William K	Modelling different ways of financing social housing in Ireland using private sector finance
Oakes, Luke	Development and evaluation of innovative, fibre-reinforced geopolymer composite solutions as permanent formwork for geopolymer cement concrete structures
O'Neill, Jennifer T	Emotional Mapping: exploring how participatory GIS can add value to knowledge on spatial identity, decision making and spatial planning
Quigley, Mura	Enabling a resilient future: exploring the leadership and governance of urban design
Quinn, Richard	Quantifying the benefit of reduced carbon output in commercial property valuation
Rainey, Karina L	The air quality and health impacts of residential coal burning within Northern Ireland
Ramirez, Miguel	Design and development of a high temperature heat pump (HTHP) for district heating and industrial applications
Rice, Laura L	Planning judicial review reformation
Sakr, Mohamed	Modelling and very large eddy simulation of large-scale hydrogen-air deflagration and deflagration-to-denotation transition
Salehi Kouhestani, Mohammad	Investigation on advanced heat pumps in domestic appliances
Sheldon, Lisa	Community resilience, health and wellbeing - exploring community resilience in flood prone areas considering the increase in flooding prevalence.
Tierney, Christopher A	Dynamic road/tyre interaction
Waddell, Campbell	Variation of race track grip
Wijayanto, Arief	Property tax as a local tax in Indonesia
Wilkinson, Allistair	Development of resilient, energy efficient geo-polymer concrete road pavement solutions
Wilson, Christopher	Development of advanced heat pump and thermal storage systems capable of cost effective demand side management

Graduated December 2016

Student Name	Thesis Title
Cotter, Donal F	The role of building simulation as an assessment methodology for new and existing dwellings
Kang, Sungwook	Fundamental technologies for development of nanoclay dispersed intumescent polymer composition in applications for built environments and automobiles
Kashkarov, Sergii	Fire resistance of on-board high pressure storage tanks for hydrogen-powered vehicles
Redpath, Gwyneth M	Risk mapping of minor ('B' class) roads in rural Northern Ireland, reasons for the high proportion of collisions resulting in death or serious injuries, especially to young drivers
Salehi Kouhestani, Mohammad	Investigation on advanced heat pumps in domestic appliances
Yates, David	Innovation solutions to reduce separation distance for hydrogen and fuel cell systems

Graduated July 2017

Student Name	Thesis Title
Kahanji, Charles	Flexural and shear capacity of ultra-high strength reinforced concrete beams under fire
O'Hare, Rachel Mary	NAMA: asset management on nonperforming real estate in a depressed economy
Pugsley, Adrian N	Development of hybrid photovoltaic/thermal (HyPV/T) facade solar collectors
Rogers, Jane B	Productivity benefits of green building occupancy
Stephenson, Jill	A study of the environmental implications and health impacts of floods in Northern Ireland
Stevenson, David M	Coastal environmental determinism. Parameters for land use planning

5. Publications

Details of all publications by BERI staff are on the Ulster University's Institutional Repository <http://eprints.ulster.ac.uk/>. This section reports those outputs published over the period of this report and classified as either journal articles, books/chapters in books, research reports and published conference papers.

5.1 Journal Articles

Arya, F, Hyde, T, Henshall, P, Eames, P, Moss, R and Shire, S (2016) Current Developments in Flat-Plate Vacuum Solar Thermal Collectors. *International Journal of Chemical, Molecular, Nuclear, Materials and Metallurgical Engineering*, 10 (6). pp. 688-692.

Asimakopoulou, E, Kolaitis, D and Founti, M (2016) Geometrical characteristics of externally venting flames: Assessment of fire engineering design correlations using medium-scale compartment-façade fire tests. *Journal of Loss Prevention in the Process Industries*, 44. pp. 780-790.

Asimakopoulou, E, Kolaitis, D and Founti, M (2017) Assessment of Fire Engineering Design Correlations Used to Describe the Geometry and Thermal Characteristics of Externally Venting Flames. *Fire Technology*, 53 (2). pp. 709-739.

Asimakopoulou, E, Kolaitis, D and Founti, M (2017) Thermal characteristics of externally venting flames and their effect on the exposed façade surface. *Fire Safety Journal*, 91. pp. 451-460.

Asimakopoulou, E, Konstantinos, C, Kolaitis, D and Founti, M (2016) Characteristics of Externally Venting Flames and Their Effect on the Façade: A Detailed Experimental Study. *Fire Technology*, 52. pp. 2043-2069.

Beekmans, J, Ploegmakers, H, Martens, K and van der Krabben, E (2016) Countering decline of industrial sites: Do local economic development policies target the neediest places? *Urban Studies*, 53 (14). pp. 3027-3047.

Benkorichi, S, Fateh, T, Richard, F, Consalvi, J-L and Nadjai, A (2017) Investigation of thermal degradation of pine needles using multi-step reaction mechanisms. *Fire Safety Journal*, 91. pp. 811-819.

Besheer, A, Smyth, M, Zacharopoulos, A, Mondol, JD and Pugsley, A (2016) Review on recent approaches for hybrid PV/T solar technology. *International Journal of Energy Research*, 40. pp. 2038-2053.

Bidanset, P, McCord, M and Davis, P (2016) Spatially Accounting for Spillover effects of Foreclosures in Automated Valuation Models to Promote Accuracy and Uniformity of Property Tax Assessments. *Journal of Property Tax Assessment and Administration*, 13 (1). pp. 5-21.

Boyce, K (2017) Safe Evacuation for all - Fact or Fantasy? Past Experiences, current Understanding and future challenges. *Fire Safety Journal*, 91. pp. 28-40.

Brandoni, C and Bosniakovic, B (2016) HOMER analysis of the water and renewable energy nexus for water-stressed urban areas in Sub-Saharan Africa. *Journal of Cleaner Production*, 155. pp. 105-118.

Christensen, P, McIlhatton, D, Blair, N and Grunninger B, Courtney (2016) Multi-Purpose 3-D Real Estate: Understanding the Role of 3-D Technology for Enhancing Resilience. *Journal of Real Estate Literature*, 24 (2). pp. 453-472.

Colclough, S, Hewitt, N and Griffiths, P (2017) Life-Cycle Cost Analysis of an Installed Multiunit Seasonal

- Thermal Energy Store. *Journal of Energy and Power Engineering, USA*, 11. pp. 439-445.
- Comiskey, D, McKane, M, Eadie, R and Goldberg, D (2016) Providing Collaborative Education with an International Dimension: An Ulster University and Pennsylvania State University Case Study (J). *International Journal of 3-D Information Modeling*, 5 (2). pp. 1-15.
- Comiskey, D, McKane, M, O'Shea, E, Hughes, J, McNiff, S and Eadie, R (2016) Collaborative & Multidiscipline Working - From Theory to Practice in 48 Hours: A Case Study from BIM Region Northern Ireland (J). *International Journal of 3-D Information Modeling*, 5 (2). pp. 55-71.
- Dadashzadeh, M, Ahmad, A and Khan, F (2016) Dispersion modelling and analysis of hydrogen fuel gas released in an enclosed area: A CFD-based approach. *Fuel*, 184 . pp. 192-201.
- Davis, P, McCord, M, McCluskey, WJ, Montgomery, E, Haran, M and McCord, J (2017) Is Energy Performance too taxing: A CAMA approach to modelling residential energy in housing in Northern Ireland. *Journal of European Real Estate Research*, 10 (2). pp. 124-148.
- Davison, K and Russell, J (2017) Disused Religious Space: Youth Participation in Built Heritage Regeneration. *Religions*, 8 (6). pp. 1-15.
- Doheim, R, Yohanis, Y G, Nadjai, A and Elkadi, H (2016) Bridging the Knowledge Gap between Fire Engineers and Building Service Engineers - Using the Analytic Hierarchy Process Approach. *Procedia Engineering*, 145. pp. 1144-1152.
- Eadie, R and Potts, S (2016) Innovation partnership procurement: EU directive impact. *Proceedings of the Institution of Civil Engineers: Management, Procurement and Law*, 169 (6). pp. 238-247.
- Eadie, R and Potts, S (2016) Will Civil Engineering and Construction SME's benefit from the changes to the 2014 European Procurement Directives. *International Journal of Civil and Structural Engineering*, 3 (2). pp. 117-121.
- Fateh, T, Richard, F, Batiot, B, Rogaume, T, Luche, J and Zaida, J (2016) Characterization of the burning behavior and gaseous emissions of pine needles in a cone calorimeter – FTIR apparatus. *Fire Safety Journal*, 82. pp. 91-100.
- Fateh, T, Richard, F, Rogaume, T and Joseph, P (2016) Experimental and modelling studies on the kinetics and mechanisms of thermal degradation of polymethyl methacrylate in nitrogen and air. *Journal of Analytical and Applied Pyrolysis*, 120. pp. 423-433.
- Fateh, T, Zhang, J, Delichatsios, MA and Rogaume, T. (2017) Experimental investigation and numerical modelling of the fire performance for epoxy resin carbon fibre composites of variable thicknesses. *Fire and Materials*, 41. pp. 307-322.
- Fuster, B, Houssin-Agbomson, D, Jallais, S, Vyazmina, E, Dang-Nhu, G, Bernard-Michel, G, Kuznetsov, M, Molkov, V, Chernyavskiy, B, Shentsov, V, Makarov, D, Dey, R, Hooker, P, Baraldi, D, Weidner, E, Melideo, D, Palmisano, V, Venetsanos, A and Der Kinderen, J (2017) Guidelines and recommendations for indoor use of fuel cells and hydrogen systems. *International Journal of Hydrogen Energy*, 42 (11). pp. 7600-7607.
- Hamzah, MO, Golchin, B and Woodward, D (2017) A quick approach for rheological evaluation of warm asphalt binders using response surface method. *Journal of Civil Engineering and Management*, 23 (4). pp. 475-486.
- Henshall, P, Eames, P, Arya, F, Hyde, T, Moss, R and Shire, S (2016) Constant temperature induced stresses in evacuated enclosures for high performance flat plate solar thermal collectors. *Solar Energy*, 127. 250 - 261.
- Henshall, P, Eames, P, Moss, R, Shire, S, Arya, F and Hyde, T (2016) Experimental measurements of evacuated enclosure thermal insulation effectiveness for vacuum flat plate solar thermal collectors. *International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering*, 10 (6). pp. 727-733.
- Huang, Y, Chen, HS, Zhang, XJ, Keatley, P, Huang, MJ, Vorushylo, I, Wang, YD and Hewitt, N (2017) Techno-economic modelling of large scale

compressed air energy storage systems. *Energy Procedia*, 105. pp. 4034-4039.

Huang, Y, Wang, Y, Chen, H, Zhang, X, Mondol, JD, Shah, N and Hewitt, N (2017) Performance analysis of biofuel fired trigeneration systems with energy storage for remote households. *Applied Energy*, 186 (3). pp. 530-538.

Ilkka, N, Mervi, M, Francesco, P, Browne, F, Davis, P and Palomares, I (2016) An Integrated Semantic Approach to Content Management in the Urban Resilience Domain. *International Journal on Advances in Software*, 9 (3&4). pp. 323-333.

Kahanji, C, Ali, F and Nadjai, A (2016) Explosive Spalling of Ultra-High Performance Fibre Reinforced Concrete Beams Under Fire. *Journal of Structural Fire Engineering*, 7 (4). pp. 328-348.

Kahanji, C, Ali, F and Nadjai, A (2017) Structural Performance of Ultra-High Performance Fibre Reinforced Concrete Beams. *Structural Concrete*, 18. pp. 249-258.

Kang, S, Choi, SK and Choi, JY (2017) Coupled thermo-physical behaviour of an inorganic intumescent system in cone calorimeter testing. *Journal of Fire Sciences*, 35 (3). pp. 207-234.

Keenan, J, Makarov, D and Molkov, V (2017) Modelling and simulation of high-pressure hydrogen jets using notional nozzle theory and open source code OpenFOAM. *International Journal of Hydrogen Energy*, 42 (11). pp. 7447-7456.

Kim, W, Shentsov, V, Makarov, D and Molkov, V (2017) Simulations of Blast Wave and Fireball Occurring Due to Rupture of High-Pressure Hydrogen Tank. *Safety*, 3 (16). pp. 1-10.

Kim, Y, Makarov, D, Kashkarov, S, Joseph, P and Molkov, V (2017) Modelling heat transfer in an intumescent paint and its effect on fire resistance of on-board hydrogen storage. *International Journal of Hydrogen Energy*, 42. pp. 7297-7303.

Kolaitis, D, Asimakopoulou, E and Founti, M (2017) Fire behaviour of gypsum plasterboard wall assemblies: CFD simulation of a full-scale residential building. *Case Studies in Fire Safety*, 7. pp. 23-35.

Maraveas, C, Tsavdaridis, KD and Nadjai, A (2017) Fire resistance of unprotected Ultra Shallow Floor Beams (USFB): A numerical investigation. *Fire Technology*, 53 (2). pp. 609-627.

McAleenan, C and McAleenan, P (2017) Critical Theory: understanding the impact language has on workers' safety and health. *Proceedings of the Institution of Civil Engineers: Management, Procurement and Law*, 172 (MP2). pp. 52-58.

McAleenan, C, Weatherup, R, Bogle, G and McAleenan, P (2016) Shale gas extraction – the case for a multi-disciplinary study. *Proceedings of the Institution of Civil Engineers - Energy*, 168 (1). pp. 41-46.

McCluskey, D, Lim, Jasmine LC, McCord, M and Davis, P (2016) Commercial leases in the UK regions: Business as Usual? *Journal of Corporate Real Estate*, 18 (4). pp. 227-253.

McCord, M, Davis, P, Haran, M and McCord, J (2016) Analysing Housing Market Affordability in Northern Ireland: towards a better understanding. *International Journal of Housing Markets and Analysis*, 9 (4). pp. 554-579.

McElduff, L, Peel, D, Ritchie, H and Lloyd, G (2016) The Octagon Values Model: community resilience and coastal regeneration. *Urban, Planning and Transport Research: An Open Access Journal*, 4 (1). pp. 1-25.

McGreal, S, Taltavull de La Paz, P, Kupke, V, Rossini, P and Kershaw, P (2016) Measuring the influence of space and time effects on time on the market. *Urban Studies*, 53 (13). pp. 2867-2884.

McIlhatton, D, McGreal, S, Taltavull, P and Adair, Alastair S (2016) Impact of Crime on Spatial Analysis of House Prices: evidence from a UK city. *International Journal of Housing Markets and Analysis*, 9 (4). pp. 627-647.

Mondol, JD and Carr, C (2017) Techno-economic assessments of advanced Combined Cycle Gas Turbine (CCGT) technology for the new electricity market in the United Arab Emirates. *Sustainable Energy Technologies and Assessments*, 19. pp. 160-172.

- Mondol, JD, Smyth, M and Zacharopoulos, A (2017) A comparative performance analysis of solar heat exchangers for solar hot water application under controlled laboratory conditions. *International Journal of Ambient Energy*, 38 (4). pp. 411-419.
- Moss, R, Shire, S, Henshall, P, Eames, P, Arya, F and Hyde, T (2017) Optimal passage size for solar collector micro-channel and tube-on-plate absorbers. *Solar Energy*, 153. pp. 718-731.
- Murphy, M and Nahod, M (2017) Stakeholder competency in evaluating the environmental impacts of infrastructure projects using BIM. *Engineering, Construction and Architectural Management*, 24 (5).
- Nadjai, A, Han, S, Ali, F, Alam, N and Ahmed, A (2017) Fire resistance of axial restraint composite floor steel cellular beams. *Journal of Constructional Steel Research*, 136 . pp. 229-237.
- Nase, I, Berry, J and Adair, AS (2016) Impact of quality-led design on real estate value: a spatiotemporal analysis of city centre apartments. *Journal of Property Research*, 33 (4). pp. 309-331.
- Newell, G and McGreal, S (2017) The significance of development sites in global real estate transactions. *Habitat International*, 66. pp. 117-124.
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5.2 Books/Chapters in Books

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5.3 Research Reports

Adair, AS, McGreal, S and Hinch, M (2017) Northern Ireland Quarterly House Price Index for Q1 2017 Report Number 130. Northern Ireland Housing Executive and Progressive Building Society. Ulster University. 10 pp.

Adair, AS, McGreal, S and Hinch, M (2017) Northern Ireland Quarterly House Price Index for Q4 2016 Report Number 129. Northern Ireland Housing Executive and Progressive Building Society. Ulster University. 10 pp.

Adair, AS, McGreal, S and Hinch, M (2016) Northern Ireland Quarterly House Price Index for Q3 2016 Report Number 128. Northern Ireland Housing Executive and Progressive Building Society. Ulster University. 10 pp.

Adair, AS, McGreal, S and Hinch, M (2016) Northern Ireland Quarterly House Price Index for Q2 2016 Report Number 127. Northern Ireland Housing Executive and Progressive Building Society. Ulster University. 10 pp.

Lowies, B, Viljoen, C and McGreal, S (2017) Property crowdfunding: Australian Investor Perspectives 2016/17. University of South Australia. 8 pp.

McGreal, S, McCord, J and Hinch, M (2016) Performance of private rental market in Northern Ireland: Summary Research Report July - December 2016. Northern Ireland Housing Executive. University of Ulster. 29 pp.

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5.4 Published Conference Papers

Eadie, R and Potts, S (2016) The new EU Procurement Directives: Whole life costing and

dynamic procurement systems for Civil Engineering organisations, are they contradictory? In: IX International Conference on Civil Engineering Design and Construction (Science and Practice), Varna Bulgaria. Вестник Строител ЕАД. 5 pp.

Eadie, R and Rice, M (2016) Level 6 Building Information Modelling (BIM) Civil Engineering Curriculum. In: 6th International Education, Science and Innovations conference, European Polytechnical University, Pernik, Bulgaria. European Polytechnical University. 6 pp.

Eadie, R, Solan, B, Magee, B and Rice, M (2016) The Pedagogy of Building Information Modelling. In: Civil Engineering Research in Ireland 2016 (CERI2016) Conference, National University of Ireland Galway, Ireland. Civil Engineering Research Association of Ireland. 5 pp.

Eadie, R, Stankov, N, Ivanov, Y and Perera, S (2016) Initial Findings on the State of E-Business in Bulgaria. In: IX International Conference on Civil Engineering Design and Construction (Science and Practice), Varna Bulgaria. Вестник Строител ЕАД. 6 pp.

Ilkka, N, Mervi, M, Browne, F, Davis, P and Francesco, P (2016) A Semantic Layer for Urban Resilience Content Management. In: The Eighth International Conference on Information, Process, and Knowledge Management eKNOW 2016. international academy research and industry association (iaria). Vol 1 6 pp.

Kuznetsov, M, Shentsov, V, Brennan, S and Molkov, V (2016) Experimental and Analytical Study of Hydrogen Jet Fire in a Vented Enclosure. In: The Eighth International Seminar on Fire & Explosion Hazards (ISFEH8), Hefei, China. USTC Press. 10 pp.

McErlane, A, Heaney, SG, Haran, M and McClements, S (2016) The Application of Stakeholder Theory to UK PPP Stakeholders. In: ARCOM 2016, Manchester, UK. ARCOM. 10 pp.

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6. Research Funding: Portfolio of Research Grants active during period 1 August 2016 - 31 July 2017

Research Institute Member	Title of Award	Funding Body	Value
Hewitt, Prof NJ Huang, Dr M Brandoni, Dr C Huang, Dr Y Griffiths, Prof PW	SPIRE 2	INTERREG VA	£1,721,018
Hewitt, Prof NJ Huang, Dr Y	Energy storage and demand-side flexibility within future electricity markets	SFI/Dept for Economy	£633,044
Hyde, Dr T Zhang, Dr J	EENSULATE: Development of Innovative Lightweight and Highly Insulating Energy Efficient Components - EEB-1-2016	CEC-H2020-IL-NANOTECH	£592,311
Hewitt, Prof NJ Huang, Dr M Brandoni, Dr C Huang, Dr Y Griffiths, Prof PW	SPIRE 2 PhD Costs	INTERREG VA	£586,820
Haran, Prof ME David, Dr PT McCord, Dr M	ASGARD –Analysis System for Gathered Raw Data	CEC-H2020-FCT-1-2015	£408,324
Molkov, Prof V Makarov, Dr DV	NET-Tools: Novel education and training tools based on digital applications related to hydrogen and fuel cell technology	CEC-H2010-JTI-FCH	£236,602
Zacharopoulos, Dr A Mondol, Dr J Smyth, Dr M	Senergy Demonstrator	Invest NI-Centre for Advanced Sus Energy	£196,747
McGreal, Prof WS	UK Collaborative Centre for Housing Evidence (CaCHE)	ESRC – UK Housing Evidence Centre	£131,128

Research Institute Member	Title of Award	Funding Body	Value
Griffiths, Prof PW Hewitt, Prof NJ Brandoni, Dr C Huang, Dr M Mondol, Dr J	INPATH-TES: PhD on Innovation Pathways for TES (Thermal Energy Storage) (LCE-20-2014)	CEC-H2020-SC-LCE-2014	£128,423
Anderson, Mr M	SUBB: Sustainable Underutilised Biomass Boiler Index	Invest NI	£120,480
Nadjai, Prof A	TRAFIR: Characterisation of travelling fires in large compartments	CEC – Coal and Steel	£120,316
Magee, Dr B	KTP Programme between Ulster University and Rapid International Ltd	TSB/INI and Rapid International Ltd	£119,755
Huang, Dr Y	RFCS-01-2015 - DIRPRIMCOAL: Direct primary coal liquefaction via an innovative co-processing approach with waste and petroleum feedstocks	CEC – Coal and Steel	£109,184
Molkov, Prof V Makarov, Dr D	Composite tank prototype for onboard hydrogen storage based on novel Ulster's leakno- burst safety technology	Invest NI – Proof of Concept	£105,980
Brandoni, Dr C Hewitt, Prof NJ	ALICE - Accelerate innovation in urban wastewater management for climate change	CEC-H2020-MSCA-RISE	£103,644
Molkov, Prof V	Hydrogen and Fuel Cells Hub Extension	EPSRC	£96,130
Hewitt, Prof N Brandoni, Dr C	GRAGE – Gray and green in Europe: elderly living in urban areas	CEC-H2020-MSCA-RISE	£82,442
Hewitt, Prof NJ	Higher Education EU Support Fund	Department for the Economy	£53,985
Adair, Prof AS Berry, Prof J Haran, Prof ME McGreal, Prof WS	Northern Ireland Commercial Property. Index	Dept of Social Dev. B.fast City Con-Vari	£40,800
Nadjai, Prof A	LOCAFIplus - Temperature assessment of a vertical steel member subjected to localised fire	CEC – Coal and Steel	£38,438
McGreal, Prof WS Adair, Prof AS	Analysis of private housing market performance - Northern Ireland quarterly house price index	NIHE	£6,000
Hewitt, Prof NJ Devlin, Mr S	REEWise Village: Fostering and Facilitating energy citizenship development in local communities	CEC NPP Northern Periphery & Arctic Pro	£3,300

Research Institute Member	Title of Award	Funding Body	Value
Blair, Dr N	Greater Monkstown Place Shaping Pilot	Antrim & N'abbey Borough CI via Place	£1,500
Choi, Dr SK	Protective clothing under extreme fire conditions	Korean Ministry of Public Safety	£146,842
Haran, Prof ME McCord, Dr M Davis, Dr P	INSPEC2T: Inspiring Citizens Participation for Enhanced Community Policing	CEC-H2020-SC Security	£146,850
Hewitt, Prof NJ Griffiths, Prof PW Huang, Dr M	Chess-Setup-EE-02	CEC-H2020 –SC – EE – 02 - 2015	£168,635
Hewitt, Prof NJ	Small Smart Sustainable Systems for future Domestic Hot Water (45-DHW)	EPSRS – Thermal Energy Challenge	£375,863
Huang, Dr Y Huang, Dr M Hewitt, Prof NJ	Distributed Energy Storage Systems	The Royal Society	£11,850
McGreal, Prof WS	House prices, rents and affordability	NIHE	£300,000
McGreal, Prof WS Adair, Prof AS Hinch, Dr M	Northern Ireland Quarterly House Price Index	Progressive Building Society	£90,000
Rafferty, Mr G	Community Participation in Planning: Learning and Skills Framework	C.E.C. Erasmus+	£182,954
Ritchie, Dr H McElduff, Dr L	Marine Spatial Planning in Northern Ireland: Towards Productive Seas and Resilient Communities?	Council of Heads of the Built Environment	£500
Woodward, Dr WDH Millar, Dr P	A probabilistic framework for improved roads management	NDP – National Roads Authority	£97,008
Zhang, Dr J	Scaling and modelling of soot, heat feedback and burning rate of large-scale hydrocarbon pool fires	Royal Academy of Engineering – NRCP Newton Res	£108,900
Anderson, Mr M	Pelletisation (READ)	Invest NI	£108,184
Lloyd, Prof MG	Communities as constructs of people and architecture	AHRC	£312,276
Makarov, Dr D Molkov, Dr V	EPSRC Centre for Doctoral Training in Fuel Cells and their Fuels: Clean Power for the 21 st Century	EPSRC	£135,000

Research Institute Member	Title of Award	Funding Body	Value
Makarov, Dr D Molkov, Prof V	GENFUEL: Addressing fundamental challenges in the design of new generation fuels	CEC – Framework 7 – MC (IAPP)	£17,471
Solan, Dr B	Short-span bridge scour under submerged flood flow conditions	The Royal Society – International Exchange Scheme	£8,900
Zhang, Dr J	High Performance Computing Support for UK consortium of Turbulent Reacting Flows (UKCTRF)	EPSRC	£27,851
Zhang, Dr J	Experimental and Modelling Large-Area Fires - Phase 2	Atomic Weapons Establishment	£131,080
Hewitt, Prof NJ	Higher Education EU Support Fund - Theme Leader Energy (NICP)	DEL	£52,484
Hewitt, Prof NJ Huang, Dr M	Interdisciplinary Centre for Storage, Transformation and Upgrading of Thermal Energy (i-STUTE)	EPSRC/ESRC	£831,903
Makarov, Dr DV Molkov, Prof V	Integrated safety strategies for on-board Hydrogen Storage Systems	EPSRC	£970,514
Zacharopoulos, Dr A Mondol, Dr J Smyth, Dr MA Hyde, Dr TJ	Concentrating Photovoltaic Evacuated Glazing (CoPEG) multi-functional building façade element	Invest Northern Ireland - Proof of Concept	£105,382
Zhang, Dr J	Flame behaviours from enclosure fires over facades in tall buildings	The Royal Society	£12,000
Choi, Dr SK Nadjai, Prof A	Development of advanced PBD method for structural fire protection using innovative insulation material	Korean Ministry of Knowledge Economy	£139,606
Molkov, Prof V Makarov, Dr DV	Hydrogen and Fuel Cell Supergen Hub	EPSRC	£182,231

