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TRANSFORMING ENERGY DEMAND THROUGH DIGITAL INNOVATION

Innovate UK

KTN
the Knowledge Transfer Network

Reducing energy demand with smart buildings

A celebration of research and innovation

#SmartBuildings15

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12-13th October 2015

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Introduction

Reducing energy demand with smart buildings

Innovation is powered by research, however research projects and innovation do not just happen by chance. They need support and guidance.

During this event we will discover how research and innovation is creating new technologies and applications for reducing energy demand with smart buildings. We will showcase the present state-of-the-art, explore the opportunities and challenges that lie ahead, and ask what further support is required over the coming years.

Over £50 billion is spent each year on energy in UK buildings. The market for reducing this energy demand is growing by up to 30% p.a. in the EU. The economic, social and environmental benefits are far-reaching. Let’s give our support to those researchers and innovators who will make this happen!

We look forward to working with you,

Dr Rick Holland, Innovate UK

Dr Steven Firth, TEDDINET

Bruce McLelland, KTN

Agenda - Monday 12th October

9:30	**Registration with coffee/pastries**
10:00	**Opening welcome from our chair:** Faith Wainwright, ARUP **OPPORTUNITIES AND BARRIERS FOR REDUCING ENERGY DEMAND WITH SMART BUILDINGS**
10:15	**Keynote 1: Government's perspective -** Craig Lucas, Acting Director of Science and Engineering, Department of Energy and Climate Change
10:40	**Keynote 2: View of the market -** Jeremy Towler, Senior Manager - Energy & Smart Technologies, BSRIA
11:05	**Coffee break**
11:35	**Keynote 3: Customer's perspective -** Damian Coulton, Group Commercial Director, Energy Saving Trust
12:00	**Keynote 4: Manufacturer's perspective -** Howard Porter, CEO, BEAMA
12:25	**Chair's remarks**
12:30	**Showcases and lunch** - Poster gallery (from TEDDINET and Innovate UK teams) - Networking activities facilitated by KTN **SMART BUILDINGS – EVALUATION, FUNCTIONALITY AND PRIORITIES**

14:00	**Workshop #1: Present day realities of smart technologies** Experiences and lessons from the £8m Building Performance Evaluation programme. - Mat Colmer, Lead Technologist, Innovate UK - Professore Rajat Gupta, Oxford Brookes University - Rod Bunn, Principal Consultant, BSRIA	**Workshop #2: The value of energy in buildings** Enabling delegates to influence what Innovate UK funds in future. - Mark Thompson, Lead Technologist, Innovate UK - Chris Bagley & Jenni McDonnell of KTN's energy team.

15:30	**Reassemble in the main room**
15:45	**Panel debate on 'Smart buildings, separating the hype from reality'** - Ian Ellis, Siemens - Jean Waring-Thomas, Utilitywise - Duncan Botting, Global Smart - Liz Reason, Greengage Trust
16:30	**Close for drinks/networking/posters**
19:30	**Venue closes**

Agenda - Tuesday 13th October

9:30 **Registration with coffee/pastries**

9:45 **Introduction to day:** Chris Slezakowski, SIG plc

SHOWCASING THE LATEST INNOVATIONS AND RESEARCH PROJECTS

10:00 **Showcase 1 – Companies supported by Innovate UK that include:**

- Xsilon
- VRM Technologies
- TerOpta
- SVDP
- NetThings
- Integrated Environmental Solutions
- Energy Deck
- Empower /EnerGenius
- E2E Services
- Demand Logic
- Cybula
- BMS Home

11:00 **Coffee break**

11:30 **Showcase 2: Aging Population Attitudes to Sensor Controlled Energy (the APASCHE project) -** Dr Stuart Galloway, Reader in Electrical and Electronic Engineering, University of Strathclyde and Prof Michael Danson, Professor of Enterprise Policy, Heriot Watt University

11:50 **Showcase 3: Energy Visualisation for Carbon Reduction (the eViz project) -** Dr Sabine Pahl, Associate Professor (Reader) in Psychology, University of Plymouth

12:10 **Showcase 4: Low Effort Energy Demand Reduction (the LEEDR project) -** Dr Richard Buswell, Senior Lecturer in Building Services Engineering, Loughborough University

12:30 **Showcase 5: Level 39 & CWG -** Review of what Canary Wharf Group is doing to accelerate smart buildings

12:40 **Chair's remarks**

12:45 **Lunch and poster showcases -** Poster gallery (from TEDDINET and Innovate UK teams)

FORESIGHT AND FINANCE

14:15

Foresight -Main room

14:15: Industry Insight Report - Future impact of lighting technologies
14:40: A future Building Energy Management Code of Practice (IET)
15:05: Digital economy opportunities within the Smart Building Sector

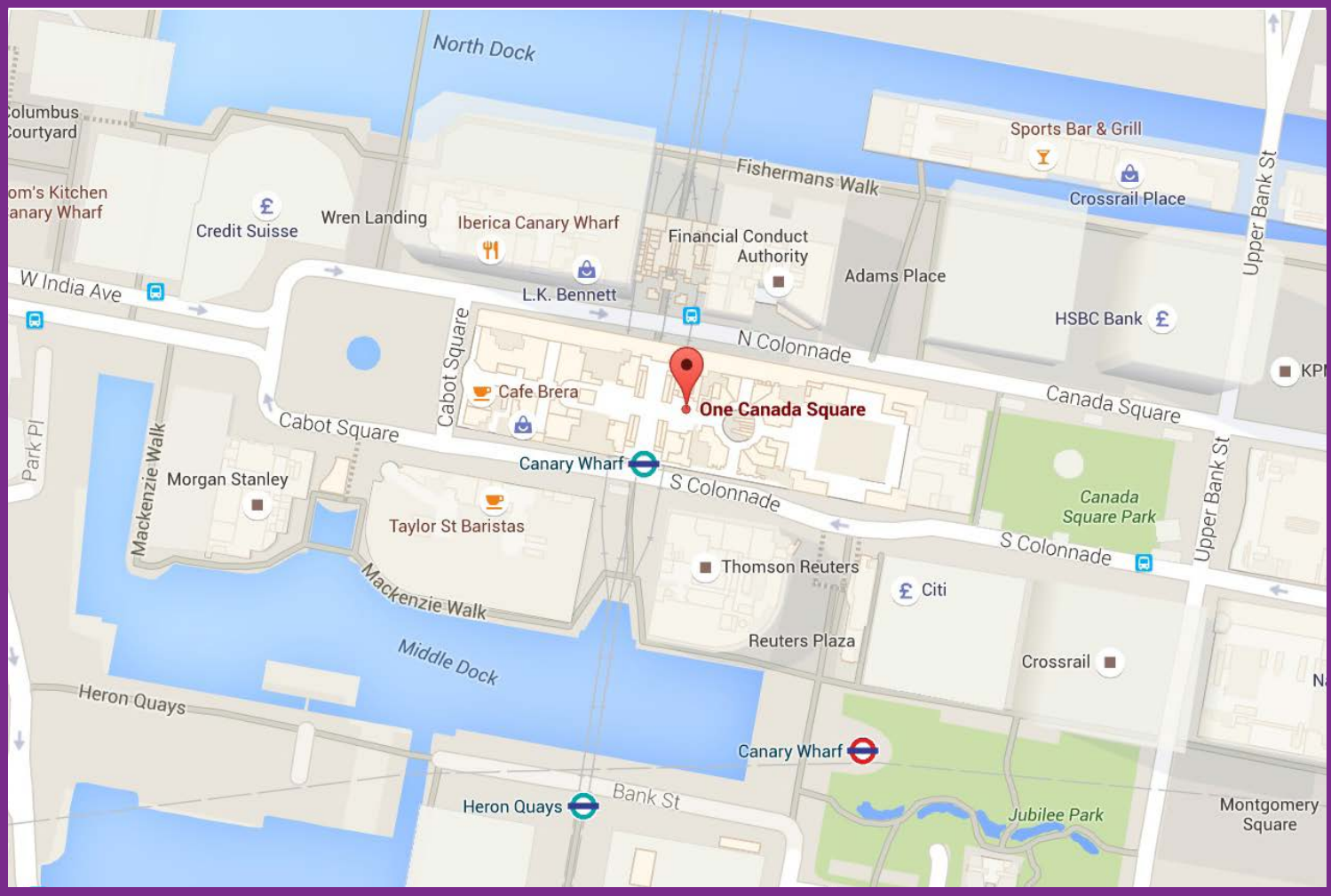
Finance - Sandbox room

14:15: Horizon 2020 calls – a briefing and guidance on engagement
15:15: Access to finance for smart technology development

15:30 **Concluding session:** Remarks, review of next steps.
Audience questions and voting on messages and priorities

16:00 **Close of event**

Map of Venue



After entering One Canada Square at ground floor road level, go to the East reception desk. This will be manned by staff who will direct you up to Level 39.

Level39 Technology Accelerator
One Canada Square
Canary Wharf
E14 5AB London
United Kingdom

Faith Wainwright

ARUP

Director

Faith Wainwright is a non-Executive Director of the KTN.

Faith is a Director of Arup, and a leader of Arup University. In her career as a structural engineer she has contributed to many award-winning projects, and became a Fellow of the Royal Academy of Engineering in 2002. Currently she is responsible for Arup's communities of practice, which involves developing the governance structures and performance requirements to inspire and support knowledge sharing, as well as identifying research and development needs.

Faith has served on the British Library Advisory Council, the REF14 Research assessment exercise and is a Vice President of the Institution of Structural Engineers. She was awarded an MBE for services to the Built Environment and Engineering Professions and holds an Honorary DENg from Bath University.

Rick Holland

Innovate UK
Lead Technologist

Rick has led several high-profile competitions and programmes since joining Innovate UK's built environment team in 2012. This includes the £4 million Future Energy Management of Buildings programme, the analysis of the £17 million domestic retrofit innovation programme, and the £1 million SBRI programme for a free-to-use digital toolkit for Building Information Modelling (BIM).

Rick is a chartered engineer and gained a PhD in smart energy technologies for UK homes in 2006. Before joining Innovate UK Rick was an energy and sustainability consultant, with experience in global practices as well as a pioneering start-up. He developed innovative consultancy services for energy studies and the business case for a higher performing built environment.

Rick's motivation stems from the unique space that buildings and infrastructure occupy in enabling the country and human society to prosper. He is a chartered member of CIBSE and chairs the innovation seminar at CIBSE's annual conference in November.

Craig Lucas

DECC

Acting Director of Science and Innovation

Craig Lucas has over 20 years' experience in infrastructure industries, mostly in the energy sector. His background is in power systems analysis, planning and design, although he also has experience in R&D management, as well as construction & operational experience in rail, power and telecommunications.

Craig is Acting Director of Science and Innovation for the Department of Energy and Climate Change. The role includes management of the central team of engineers and scientists providing support to all DECC programmes, development of the policy framework for energy sector innovation, responsibility for DECC's innovation funding programme, DECC's climate science programme, including the Met Office Hadley Centre, and the co-ordination of civil nuclear R&D activities, as well as the development of the science and engineering profession within the department.

Craig's career started in London Underground Ltd, he them moved to London Electricity, later EDF Energy, before a period spent in consultancy in various roles. After being self-employed and working for a period in Mott MacDonald he worked for specialist consultants PPA Energy, where he focused on a range of themes internationally including grid integration of renewable energy projects, management of innovation projects, engineering support to energy regulators and technical advisory work for governments and other public institutions.

He is also a Non-Executive Director of Shaftesbury Partnership Ltd, a business specialising in innovation in the social enterprise sector.

He is a Fellow of the Institution of Engineering and Technology and a member of the IET's Energy Policy Panel.

Jeremy Towler

BSRIA

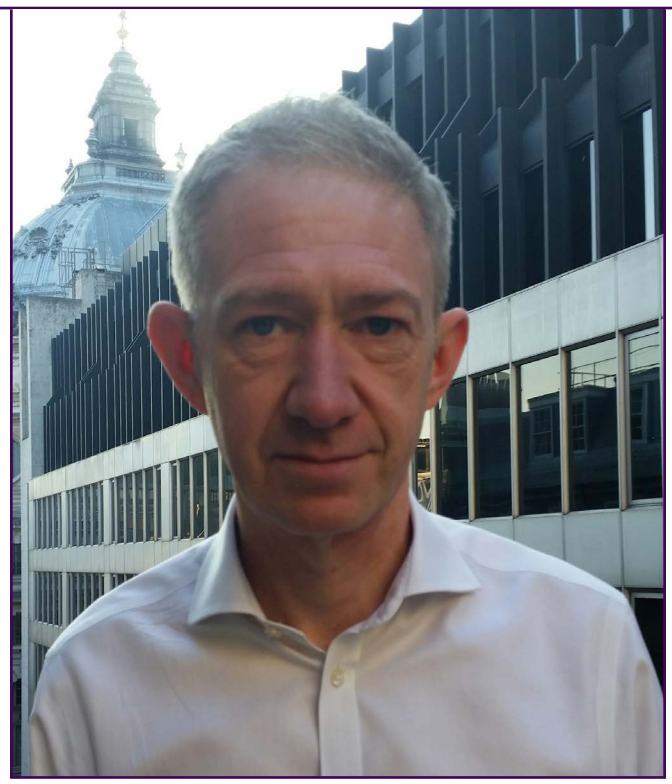
Senior Manager – Energy & Smart Technologies

Jeremy Towler leads BSRIA's consultancy and market research activities for smart technologies in buildings, energy management, cloud, big data, internet of things, and works with clients to help them to identify market trends, business threats and opportunities and develop winning strategies.

Jeremy has over 35 years' techno-commercial experience in markets including building automation, controls, fire, security and lighting systems.

Educated in the UK, Canada and Switzerland, Jeremy previously worked for Honeywell, Landis & Gyr (now Siemens), ABI Ltd (now part of Stanley Security) and i&i-Proplan – an intelligent buildings consultancy.

Building on a technical career in electronics, Jeremy also holds qualifications in business administration and mergers and acquisitions.



Damian Coulton,
Energy Saving Trust
Group Commercial Director

Damian Coulton joined the Energy Saving Trust in 2014 to lead their commercial activities. His ambitions are to take a strong, established brand into new markets and segments, and to develop new propositions by building upon the Energy Saving Trust's strengths. He firmly believes that energy efficiency is the key to the energy challenge and that the Energy Saving Trust is well placed to lead on this.

Damian has held leadership and consultancy roles in sales and business strategy in the energy industry, both domestic and international. As an independent consultant he advised clients on strategy, growth and market entry. His projects have included sales and marketing strategies, segment evaluation, renewable energy generation, electricity market reform and new product development in the energy efficiency markets. As general manager of International Power he set up and managed its retail supply business. He also led a review into the feasibility of establishing a trading business in Turkey. He has also held marketing, operations and managerial roles with E.ON and Total Gas & Power.

Howard Porter

BEAMA

Chief Executive Officer

Dr Porter is the CEO of BEAMA, the Trade body for the UK electrical manufacturing industry. He has been in this post for 6 years, having previously headed up the energy sector of BEAMA and serving as its Marketing Director. He has a number of accompanying roles in particular in Europe as Chairman of the ORGALIME board, the Brussels based industry body for the electrical mechanical industries in Europe. He has a particular expertise in energy and the use of energy, with DPhil in the energy efficiency of housing, and leadership of a number of BEAMA initiatives including smart metering, integration of electric vehicles, and smarter grid technologies.

Dr Porter believes that the future challenges for the industry mirror those of much of UK society: managing the trilemma of energy issues: mitigating climate change; securing energy supplies; keeping costs affordable for end customer, improving the skills of all in the industry and the integration of new disruptive technologies into the UK electrical industry.

Bruce McLelland

Head of the Built Environment

After graduating from De Montfort University in Systems Engineering, Bruce initially went into the music industry gaining further qualifications in sound engineering.

Following his time in the music industry, Bruce went back into Systems Engineering with Fujitsu to project manage the delivery of a number of high value IT infrastructure installations including the NHS back-end infrastructure upgrade at Richmond House and the installation of an EDS/EBS global private banking network.

On the completion of the NHS projects, he moved to the Institution of Engineering and Technology (IET) to lead on a number of business steams within their Knowledge Management division. He spent a number of years developing the IET partnership strategy in a variety of sectors including power transmission/ distribution, electromagnetics, building energy efficiency and Infrastructure Risk and Resilience. Notable deliverables included the planning and implementing the IET's online community support strategy, the delivery of the IET's partnership with London 2012/Olympic Delivery Authority as well as a number of initiatives with the MoD exploring novel applications of high power RF resources in the UK. The final programme with the IET delivered thought leadership on the protection of infrastructure assets from a variety of natural and man-made threats following his involvement in the FP7 Highways Infrastructure programmes.

Now working for the Knowledge Transfer Network, the focus remains with the future city challenges, the impact of connected systems and urban innovation programmes and where the opportunities lie for the innovators in this sphere. In addition to spot where other sectors could benefit from innovation within the Built Environment and visa versa.

Mat Colmer

Innovate UK
Lead Technologist

Mat is a specialist in building performance assessment research and has spent the last 8 years leading large-scale projects that investigate the performance of buildings and their systems.
Since May 2011 Mat has been working with Innovate UK within the Built Environment team. Mat's specific responsibility is for the £8 million Building Performance Evaluation (BPE) programme, which is assembling a substantial body of data for many building types and drawing conclusions on strategies to achieve desired performance.
Prior to being with Innovate UK, Mat was Head of Technology at the Energy Saving Trust leading on the their housing and technology field trial activities, including managing the delivery of the Retrofit for the Future programme on behalf of Innovate UK.

Mat has a Masters in Environmental Technology from Imperial College London and is an active member of many industry working groups where he uses his wide knowledge of issues relating to the performance gap to inform and affect change.
His interests in the root causes of poor performance in buildings and associated challenges to sustainability come from over 15 years of working in the built environment sector.

Rajat Gupta

Oxford Brookes University
Professor

Professor Rajat Gupta is Director of the multi-disciplinary Oxford Institute for Sustainable Development (OISD) and Low Carbon Building Research Group at Oxford Brookes University (UK), where he also holds professorial chair in sustainable architecture and climate change. He developed the RIBA award-winning DECoRuM model for carbon mapping communities. In 2013 Rajat was voted as one of 13 international building science stars.

As Principal Investigator, he has won over £8million in research grants from ESRC, EPSRC, EU, Innovate UK, World Bank, UNEP, RICS and British Council. Recently Rajat was PI on a 4 year ESRC/EPSRC funded £1.14 million EVALOC project on evaluating the impacts of low carbon communities on localised energy behaviours. Rajat has also been lead academic on several Innovate UK funded projects under the Retrofit for the Future, Invest in Innovative Refurbishment, Building whole-life performance and supply chain integration competitions.

Rajat is an appointed building performance evaluator on Innovate UK's £8million BPE research programme. He has also been instrumental in developing and pilot-testing the World's first Global Common Carbon Metric (CCM) for UNEP.

Rajat has advised international agencies (UNEP, World Bank, UN-Habitat) and is on the boards of several key organisations and task groups.

Roderic Bunn

BSRIA

Principal consultant

Roderic Bunn works for the UK research agency BSRIA and has a track record in building performance research. An experienced building researcher and technical author, he edited the Chartered Institution of Building Services Engineers Journal (CIBSE) for 16 years. Between 1995-2001 he led the ground-breaking PROBE post-occupancy evaluation research project, after which he joined BSRIA as a building performance analyst.

Roderic writes and lectures widely on building engineering and on the role of human behaviour in building performance. He regularly advises building owners and design teams on ways to ensure their design ambitions are achieved in reality. He is a Building Performance Evaluator for the UK's £8 million Building Performance Evaluation research project, and is also overseeing projects on for Innovate UK's Innovative Refurbishment programme.

Roderic currently divides his time between BSRIA and University College London where he is studying for an Engineering Doctorate. His research project is on occupant satisfaction and wellbeing metrics for Soft Landings projects.

Roderic has a particular focus on post-occupancy evaluation of new and existing schools and educational buildings. He was chief editor for the UK Department of Education guide: Design of Sustainable Schools: Case studies. He is a Fellow of the Royal Society of Arts, a former Trustee of the Usable Buildings Trust (UBT), and a Silver Medallist of the CIBSE.

Mark Thompson

Innovate UK
Lead Technologist

Mark joined the Innovate UK Energy Team in February 2015 as Lead Technologist for Energy Systems, with a specific interest and focus in delivering energy user value propositions and new business models. Prior to this he led the innovation delivery team at the Energy Innovation Centre, sourcing and managing innovation projects for the electricity and gas network operators. Prior to that, his career covered roles in engineering, project management, manufacturing in the automotive sector, and the development, marketing and commercialisation of IP in the university sector.

He also has strong personal interests in the built environment, energy retrofit and renewables, EVs and energy user behaviour.

Duncan Botting

Global Smart
Managing Director

Duncan currently holds the posts of Director European Utilities Telecoms Council and Managing Director Global Smart Transformation Limited. In these roles he works closely with customers, academia, industry, government and regulators to deliver innovative technical, commercial, environmentally balanced and culturally acceptable solutions to market challenges. He also provides mentoring and business acceleration services to numerous SMEs to help them achieve their strategic aims. Some of his previous roles include: Business Innovation and Growth Director at Parsons Brinckerhoff (part of Balfour Beatty Group), Executive Chairman of the Scottish European Green Energy Centre, Managing Director ITI Energy (a research institute), Head of Technology & Business Development for ABB, Departmental Head of Schneider Power Projects, a Mathematician and Radar Modelling Engineer with Thorn-EMI Electronics. He has over 35 years experience covering the complete spectrum of technical and commercial roles from apprentice to boardroom. He is a visiting professor at the University of Strathclyde, Glasgow.

He is an active member of the Institution of Engineering and Technology (IET, formerly the IEE) and is involved in many influential panels, advisory boards and committees at a National, European and International level.

Ian Ellis

Siemens

Marketing Manager

Ian Ellis is Marketing Manager for Siemens Building Technologies in the UK who are a leading provider of innovative safety, security and energy management solutions

Ian was President of the Building Controls Industry Association (BCIA) for four years. The BCIA is the unified voice of the UK Building Controls Industry promoting the message that building controls are key to saving energy (and hence money) in buildings.

Jean Waring-Thomas

Utilitywise
Commercial Strategy
Consultant

Jean is a passionate and experienced manager with a wide ranging background in energy, carbon and water and strong interpersonal and technical skills. This breadth of experience and a pragmatic approach has led to many opportunities to develop energy and carbon policy with various government bodies on compliance schemes such as CRC, ESOS and GHG reporting as well as working with bodies such as the British Retail Consortium (BRC), Confederation for British Industry (CBI), the Association for Decentralised Energy (ADE, formerly the CHPA) and the Carbon Trust.

Jean has worked as a project manager, strategy manager and energy manager in retail and the water industry and is now working with Utilitywise on strategy within the consultancy team.

Specialties: energy, carbon management, energy & carbon policy, climate change, water, CIBSE Low Carbon Consultant, CIBSE Lead ESOS Assessor.

Liz Reason

Greengage Trust
Managing Director

Low energy buildings are an imperative for their economic, environmental and social benefits. Meeting the challenges and capitalising on the opportunities requires expert understanding, practical experience and the drive and determination to make things happen. A recognised champion of sustainable buildings with 35 years of experience, Liz provides expert advice to policy-makers, developers, housing associations, contractors and more.

Chris Slezakowski

Greengage Trust
Managing Director

After studying Physics at University, Chris worked in the industrial sector, directing teams that supplied products for the aerospace, automotive, white goods manufacturing and heavy engineering markets. In 1998 he joined Hepworth Building Products as Sales Director for concrete products, and subsequently joined Burdens as Group Sales Director. He has worked in the UK and Ireland construction markets for over 15 years as a manufacturer and as a distributor of construction materials.

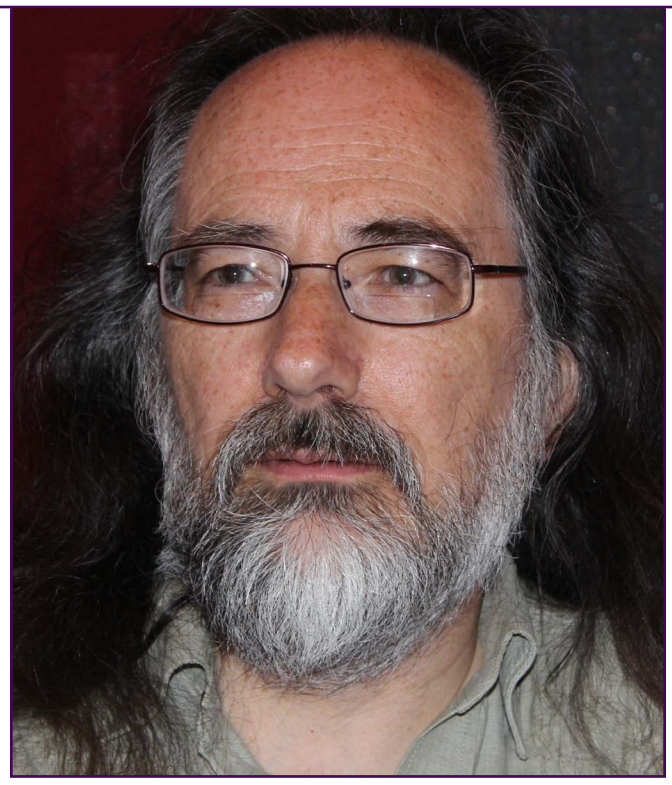
Chris is National Accounts Director for SIG plc, a major supplier of specialist building products, who he joined in 2006. His role involves engaging with major UK construction contractors and co-ordinating the activity of SIG Group companies with major projects such as the Olympics, Building Schools for the Future programme and Healthcare PFI/PPP schemes.

He contributes to trade associations and industry bodies such as Constructing Excellence, The Modern Built Environment Knowledge Transfer Network and the Construction Products Association. In 2000 he chaired the committee responsible for publishing ground-breaking research into the environmental impact of drainage systems in the UK, one of the first studies drawing attention to concerns about sustainability.

Stuart Galloway

University of Strathclyde
Reader

Dr Stuart Galloway is a Reader in the Institute for Energy and the Environment at the University of Strathclyde. He is a lead investigator on several major collaborative UK research programmes (EPSRC APAtSCHE, Realising Transition Pathways, Supergen+ for HubNet, Grand Challenge: Top & Tail), internationally (EU ORIGIN, EnergyMare) and on number of industrially supported research projects (NINES, EDRP). He works on both primary and applied research and has well established links with industry (Scottish Power, Scottish and Southern Energy, National Physical Laboratory, Raytheon) and academia. He is Deputy Director of the Rolls-Royce University Technology Centre in Electrical Power Systems, he leads the Demand Side Management and LV Networks research at the Power Networks Demonstration Centre in Cumbernauld, and is an invited member of Scottish Government CARES Local Energy Challenge Fund/ IIF expert panels (advising on large-scale local low carbon demonstrator projects). He has worked in academia since 1998, 150+ publications.



Michael Danson

Heriot-Watt University

Professor

Mike Danson is Professor of Enterprise Policy and Director of Doctoral Programmes at Heriot-Watt University. He has researched widely on such issues as ageing and poverty, peripheral and island communities, regional economic development, Gaelic, economic impacts, volunteering, employability, early onset dementia in the workplace, microbreweries and whisky. With 15 edited books and over 200 papers published, he has frequently undertaken action and policy research for national and local governments and agencies, and has been commissioned by the OECD, European Commission, WHO amongst others. He has been the Treasurer of the Academy of Social Sciences since 2004 and was previously Chair of the Regional Studies Association and has served on the boards and committees of several societies. He has been working with colleagues on the EPSRC APAtSCHE (Ageing population attitudes to sensor controlled home energy) project. Our findings are reported in 'The ageing population and smart metering: A field study of householders' attitudes and behaviours towards energy use in Scotland' in 'Energy Research & Social Science' published online 29 August 2015, DOI information: 10.1016/j.erss.2015.08.020. He can be followed on Twitter with @MikeDanson1

Sabine Pahl
Plymouth University

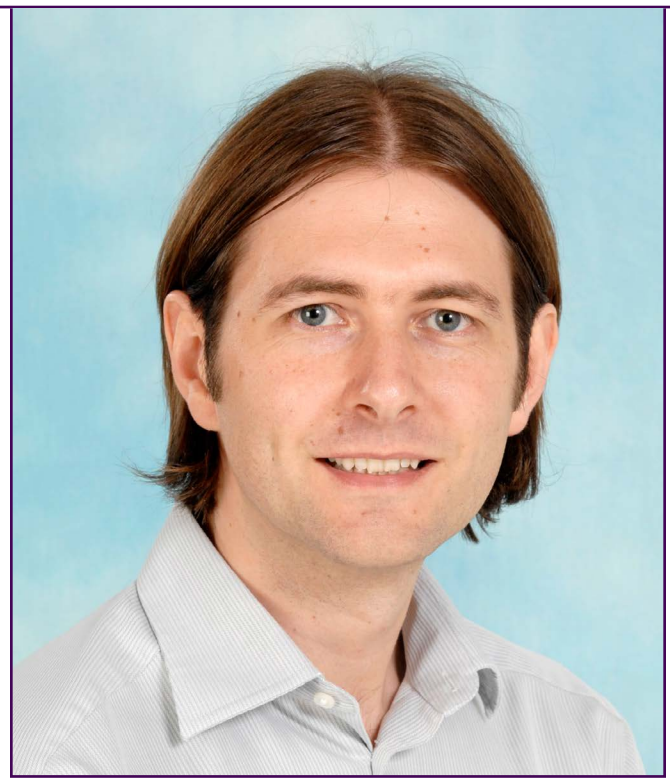
Sabine Pahl is an applied social psychologist at Plymouth University. Since 2010 she has had over 25 peer reviewed publications and been PI or Co-I on grants totalling over £7 million (approx. £2 million as PI) from funding bodies including EPSRC, ESRC, FP7, DEFRA and H2020. The ongoing interdisciplinary EPSRC-funded eViz-project develops and tests energy visualisations to reduce energy demand and is run in collaboration with three other UK universities and external partners. eViz recently ran a 6,000 home trial in collaboration with Plymouth City Council, DECC and the Behavioural Insights Team. The new H2020-funded enerGAware project aims to develop a serious game to address energy demand and fuel poverty in social housing tenants. Sabine Pahl is the Secretary for the International Association of Applied Psychology's Environmental Division. She was the lead convenor for two sessions (behaviour change and perceptions of climate change) at the UNFCC COP21 science conference in Paris in July, which summarised the science to inform the COP 21 policy meeting in December this year.

Richard Buswell

Loughborough University
Reader

Dr. Richard Buswell is a Reader in Building Energy Systems with research interests in end use energy demand, system performance, numerical modelling/analysis methods and advanced facade manufacture (3DCP).

Richard has spent more than 25 years working with building energy systems, from HVAC installation management in the construction industry through to building performance assessment, the application of fault detection and more recently in end use energy demand, focusing on reduction analysis and the relationship people have energy.



Steven Firth

Loughborough University
Senior Lecturer

Dr Steven Firth is a Senior Lecturer in Building Performance Modelling at Loughborough University, where he is a member of the Building Energy Research Group in the School of Civil and Building Engineering.

He is the Principal Investigator of REFIT, a Research Council Energy Programme £1.5 million 3 year research project on Smart Homes and Energy Demand Reduction.

He is also the Deputy Director of TEDDINET, the Transforming Energy Demand through Digital Innovation Network, which brings together £22 million of Research Council funded projects with government, industry and other stakeholders.

Dr Firth's research has been funded by EPSRC, EU FP7, UKERC and DECC in the areas of ICT for Energy Efficiency, household end-use energy demand, household appliance energy usage, domestic heating practices and domestic stock modelling.

Xsilon

Smart in-building micro-grid for energy management

Most building energy management applications require some form of networking. Currently the deployment of these applications is greatly hampered by the lack of an appropriate communications infrastructure in most existing buildings.

The aim of this project is to provide existing buildings with a communications infrastructure that opens them up for the cost-effective installation of control and other systems that conserve energy and/or improve occupant well-being. The easy-to-install unified power and communications network that will be the result of this project will allow building owners and occupants to add functionality in a modular plug-and-play fashion at a much lower cost than existing solutions.

In terms of data rate the network will be future-proof, able to deal with narrow-band applications up to CCTV surveillance. As all electronic modules that run off this system benefit from the protective network environment, equipment life will be extended as well.

As the network lends itself for a wider variety of applications, not only energy-related, the investment in the basic network is amortised over a broader range of functions, improving ROI.

VRM Technology

VRM is a software business focused in construction for new build and refurbishment works. It has developed a SAAS technology “Refurbify” that securely captures details of built assets along with their location. A combination of Internet and smart phone technology enables its management software platform to complete detailed and audited supply chain management at the work team level.

What is the aim of your project?

The construction sector has historically been constrained by a lack of transparency and considered high risk by traditional financiers with the result that affordable working capital is often unavailable to small contractors. Refurbify addresses this problem by providing a clear audit trail combined with the ability to automatically generate VRM is now working in partnership with Investec Asset Finance (IAF) to leverage the technology to develop an innovative, new to market finance Joint Venture (JV) that will provide a complete prepayment solution for the construction sector.

What approach did you take to address the challenge?

By combining the cutting edge technology of VRM with the financial strength and expertise of IAF this JV will create a unique supply chain finance solution enabling purchasers (typically government agencies or large corporates) to utilise their own balance sheet strength to provide immediate cash settlement for suppliers (typically smaller sub contractors) whilst continuing to benefit from extended settlement credit terms.

How will we make money from this?

Refurbify generates revenue through annual recurring software license fees and client services supplied as required to customise reports on Refurbify or to integrate it directly into client systems. The new fintech model will make a percentage of the profits generated from the early payments JV with IAF.

What are the next steps?

The initial focus is to get 5 out of the top 100 contractors and 5 out of the top 50 Housing Authorities using Refurbify. We intend to use the resulting case studies to create a strong market presence for the product, while at the same time leveraging the resources in IAF to provide introductions to potential new clients.

VRM Technology Limited

E neill.ryan@vrmtechnology.co.uk
T 0203 468 7560

Address
111 Grosvenor Road
London
SW1V 3LG.

TerOpta

ASSEMBLE | Adaptive SystemS for Energy Management in Buildings with Low cost and Enhanced usability

The aim of this project is to develop an innovative, easy to install, flexible, low cost building monitoring and management system infrastructure and interface.

The system will harness the benefits of the power line carrier technology currently used by TerOpta in its lighting control system in avoiding the need for additional wiring whilst not being subject to the constraints and drawbacks of wireless technologies. This in turn will make the product well suited to both new build and refurbishment applications. It will be well suited to smaller and simpler commercial buildings which would not traditionally have BMS installed.

The product will comprise a basic energy metering and monitoring layer which is then expandable through the addition of supplementary modules offering the ability to incorporate control and management functions of varying levels of sophistication depending on the building context and targets.

Particular emphasis is to be placed on innovation in simplification ie, creation of a BMS system that is as low cost, robust and as simple to install and commission as possible.

SVDP

MyCloudControl - Known Energy Bills

This project will establish a consortium to innovatively address heating control management in the domestic sector.

MyCloudControl is a robust, self-learning cloud-based heating control platform that will monitor the micro and macro environment of homes by using sensor systems and a novel algorithm. The scheme will enable an improvement in heating efficiency and manage annual budgeting to meet the householder's need without compromising their thermal comfort. As additional features, MyCloudControl will offer non-intrusive monitoring of the vulnerable based on system engagement, and track boiler CO emissions to predict servicing needs. Presently, no such integrated technology exists.

A Technology Strategy Board SMART "Proof of Market" study highlighted the need for the device by the end users and domestic boiler suppliers. The experienced management and advisory team together with the main collaborating partner, the National Energy Foundation and the Orbit Group will develop a "Beta" prototype, a self-learning algorithm, de-risk the business and deliver the project objectives within the £329,180 budget in 15 months.

NetThings

Addressing the SME Energy Challenge

NetThings, Edinburgh Napier University and Scottish Power will work together to better understand how energy is consumed in SMEs through the analysis of real time data and user behaviour and to develop test devices and software that will help verify the viability of new energy management products that could be commercialised to SMEs in UK and overseas markets.

The project will take approximately 24 months and the outcome will be to provide integrated SME energy management solutions that could deliver up to 20% energy savings, at a suitable cost and based on real understanding of SME energy consumption profiles.

Integrated Environmental Solutions (IES)

IES is a global leader in building performance simulation, its technology can be applied across:

MASTERPLANNING: Energy related 3D decision and mapping tools for urban planners.
DESIGN: Cloud based building physics modelling for Zero/Low Energy Buildings.
RETROFIT: Operational data driven 3D models and Apps to inform deep retrofit.
BUILDING OPERATION: 3D model based feedback, control and prediction in real-time.
SMART CITIES: Real-time intelligent optimisation of building-linked energy, waste, water and transport

What is the aim of your project?

In today's digital world the way we understand our properties and how they use energy is set to drastically change. Big Data will enable us to collect energy related information about our building that we never thought we would. Engagement with citizens through social media, apps, games etc. are going play an important role in predicting energy use, identifying how we can stop waste, telling us which improvements will make the most difference and helping us control our use.

What approach did you take to address the challenge?

As part of the £24 million project funded by Innovate UK, IES created an Energy App for Glasgow Future Cities. It was designed to engage Glasgow residents in making their properties more energy efficient but also to deliver Information to the council to help them make city scale assessments of energy use. Using IES's advanced building performance software, which is used by the world's leading architects and engineers, it builds a 3D model of a property and sends it to the cloud to calculate energy use. It takes into consideration the property's size, location, recent weather, properties of the construction materials and how you use the building to make the calculation. The app also delivers an open 3D map of Glasgow to display the collected data.

How will we make money from this?

Tailored versions of the app will be available for purchase by other cities, and engagement with local technology and service providers will also provide an advertising revenue stream.

What are the next steps?

A new energy app, Re:form will be the next generation aimed at commercial buildings across Europe. Re:form gives guidance based on user input and location on how best to finance and implement the suggested improvement strategies, focusing on the business case. We are currently trialling it on test sites across Europe (Scotland, Italy, Poland and Spain).

Ruth Kerrigan
Director, Head of Research
E ruth.kerrigan@iesve.com
T 0141 945 8500
W www.iesve.com

Address
IES Headquarters
Helix Building
West of Scotland Science Park
Glasgow
G20 0SP

EnerGenius

Energy Management System incorporating Integrated Retrofit Decision Model

Development of a Decision Tool, integrated within an Energy Management System, for predicting outcomes of energy-related building retrofit actions, plus development of domestic demand side management functionality to enhance system stability, improve electricity market efficiency, increase wind energy utilisation and reduce carbon emissions.

Sustainable Homes

The CROHM Live project is designed to provide actual domestic energy usage information. This can be used to evaluate the efficacy of energy saving actions that social landlords undertake. It will do this by monitoring and modelling energy usage information before and after an energy saving intervention.

What is the aim of your project?

The project will develop a tried and tested model of domestic energy usage. It will incorporate fabric and occupant behavioural information. This model will enable social landlords to take behaviours into account when evaluating energy saving interventions they might make. For example they can ensure that contracted energy efficiency works do actually result in energy bill savings. Another example is to test a new energy saving product. This is currently difficult to do. One risky option for landlords is to assume that an intervention works (or not!) based on limited information. Another costly option is to carry out mass installations so that variations in behaviour are taken in to account statistically.

What approach did you take to address the challenge?

Modelling is based on established home energy modelling and novel behavioural modelling. The model will be tested, refined and calibrated on a wide range of existing homes in the study. Each home in the study has been extensively surveyed and has monitoring equipment installed, which relays information to a web based portal which saves costs on meter data collection.

How will we make money from this?

By selling the CROHM Live service to social landlords. This will save landlords money when testing new interventions. For example, they can test a new product with minimal installs and by remotely collecting energy meter readings. Similarly, landlords can avoid lengthy contractual disputes with contractors over whether or not a product was installed correctly or not.

What are the next steps?

Complete the modelling and commercial evaluation. Then start selling the service!

E info@sustainablehomes.co.uk
T 020 89730429
W www.sustainablehomes.co.uk

E2E Services

EMPower

This project aims to help communities have a greater say in how their electricity is generated and managed, and to reward energy customers financially through savings on their electricity bills.

A feasibility study in Innovate UK's Buildings Better Connected programme demonstrated through simulation that communities with electricity micro-generation and storage capability could have a lower carbon footprint and see a better return on investment through co-operative energy management than they would have without storage capability, based on the same total consumption.

This project will design and implement a prototype to validate and market test the concept. The project is innovative because it optimises energy generation and usage at the community level rather than building level. The approach is very scalable.

The project team is E2E Services to develop the technical solution; Encraft for commercial design and energy market expertise; University of Nottingham for energy assessment tools and techniques; and Bath & West Community Energy in the role of launch customer with a track record of delivering innovative solutions into the community energy market.

Demand Logic

Energy Management & Analysis Exploiting Existing BMS Infrastructure & Data

Our proposal is to acquire and apply a broad range of knowledge and skills to substantially expand the capabilities and applications of an existing, Ashden Award 2014 nominated, building performance analysis platform.

The current platform extracts data from existing BMS systems and undertakes analysis far beyond the capabilities of the BMS (designed for control, not analysis). It has already identified £500,000 of annual saving at King's College London and extensive savings at other sites.

Our proposal is to collaborate with Environmental Design Solutions Ltd, Verco and London South Bank University to: draw on data-mining techniques to increase speed and scope of analysis, interface with modelling software to compare design versus performance, interface with strategic carbon management software, enable dynamic demand control and develop interfaces for a range of audiences – including education and training.

Cybula Ltd.

Using novel pattern matching algorithms designed for use on large data, Cybula is developing analytical software and data management solutions which can be used to detect events using monitored time series data. There are many applications across engineering, medical and financial sectors, where performance data from complex assets is assessed for abnormal events or fault condition.

What is the aim of your project?

This project aims to build a Retail Energy Management System which detects events on sub-metered energy data from a portfolio of supermarket stores. Rather than replicate what most Energy Management Systems do (i.e. visualise the data), the consortium want to link the energy data to other external data (weather data and building data) so that models can be used to normalise performance across a porfolio of stores.

What approach did you take to address the challenge?

We have extracted and cleaned 2 years of energy and temperature data, collected at 30 minute intervals across 40 stores. In collaboration with Leeds Beckett University, we are developing models of the heating/refrigeration cycles within a store identfying the key input parameters. Using the actual and simulated data, we can then develop event models which are used to detect either abnormal performance or specific events in 'real time'.

How will we make money from this?

We are aiming to provide a low cost, simple to use yet scaleable software platform that integrates with our approach to asset monitoring to allow organisation to provide a more advanced way of monitoring and controlling energy use within buildings. We intend to licence the platform but in addition provide a service by building, validating and maintaining event detectors used within an application.

What are the next steps?

We will continue to work with a major, international supermarket chain during the final stage of this project. We are interested in similar applications for monitoring assets, equipment or energy control within any commercial building. We are extending our links with building management service providers and building management control software companies.

John McAvoy
Commercial Director
E mcavoy@cybula.com
T 07842 405 625
W www.signaldataexplorer.com

Address
Computer Science Building
Deramore Lane
York
YO10 5GH

Thermionix

Thermionix is a Predictive/Adaptive Energy Consumption Control Systems (PEACCS) which makes the most efficient use of energy in domestic, commercial and industrial settings by predicting energy demand and balancing the timing and amount of energy used, reducing carbon emissions by cutting waste and saving cost.

What is the aim of your project?

At the heart of Thermionix are the predictive algorithms for energy management and the secure wireless communications technologies. This project was designed to develop, test and refine these technologies and make them market ready.

What approach did you take to address the challenge?

Working with an early adopter partner, Gentoo Plc. Trial properties have been equiped with the Thermionix hardware and connected wirelessly to the cloud computing system, allowing the Thermionix team to monitor and refine the PEACCS system. Thermionix has been in full control of the heating of these properties for nearly a year, resulting in improved comfort and reduced energy bills. The trial is currently being extended to high rise properties and other challenging installations.

How will we make money from this?

Thermionix has been designed as a retro-fit technology which can be added to existing buildings; from a single occupancy residential property to multi-occupancy residential buildings, office blocks, commercial properties and residential tower blocks. This cloud based intelligent energy management system balances building performance characteristics against user requirements and the weather forecast, to ensure that only the energy actually required is used, reducing carbon emissions by cutting waste and saving cost. Thermionix is Smart Grid Compatible and can balance energy demand across the day, reducing peak load and taking advantage of lower cost ‘Smart Tariff’ energy.

What are the next steps?

The Thermionix team are currently working to finalise the launch product technology, and bring Thermionix to market.

Mike Hartley
BMSHome Limited
E info@thermionix.com
W www.thermionix.com

Address
St Peter’s Gate
Charles Street
Sunderland
SR6 0AN

APAtSCHE

Aging Population Attitudes to Sensor Controlled Home Energy

APAtSCHE is an EPSRC funded collaborative research project incorporating University of Strathclyde, Heriot Watt University and Glasgow School of Art. Working with Dumfries & Galloway Housing Partnership, the implications of smart energy technology on more vulnerable demographics has been investigated with end users providing operational and design guidance for future longitudinal energy studies.

What is the aim of your project?

APAtSCHE proposes to look at the technical and social issues surrounding developing and deploying home automation technologies in social housing inhabited by senior citizens. The attitudes of this age group and their willingness to invest in and trust energy saving technology are very important given that the UK population is aging and that this demographic will come to dominate in years to come.

What approach did you take to address the challenge?

APAtSCHE proposed that a combination of occupancy sensing, self-learning environmental monitoring and informative control interfaces has the potential to not only constrain variation in domestic load, but provide the necessary information to quantify its changes with respect to the deployed technology. User interviews and monitoring studies were conducted over 4 sites with 30 homes being monitored over a 2 year period. The resulting data set has uncovered new findings on occupancy patterns, preferred levels of thermal comfort, load diversity and attitudes to energy supply and use.

How will this research have impact?

Presently, the opaque nature of energy consumption is cited as a reason for household inefficiencies as behaviour cannot be related to energy use, while loss of control was often cited as a key concern of domestic energy customers in qualitative studies of energy use. Technologies which highlight constituent elements of the overall domestic load and map these to actual activities of the householder could be seen as a vital bridging step in establishing trust in home automation.

What are the next steps?

APAtSCHE has developed a software platform that continues to be used in energy monitoring and control projects and, as open source, can be adopted by other researchers and modified for their own purposes. The corresponding hardware developed for the project has now moved beyond the proof of concept stage to focus group informed prototypes that will allow researchers to move away from the ad-hoc approaches to energy monitoring.

Stuart Galloway
Principle Investigator
E stuart.galloway@strath.ac.uk
T +44 (0) 141 548 5856
W www.itl-energy.com

Address
Institute for Energy and Environment
Dept. of Electronic and Electrical Engineering
University of Strathclyde
G1 1XW, UK

B-bem

B.bem is a 3-year research project at the University of Cambridge, funded by the Engineering and Physical Sciences Research Council (EPSRC) for energy management in non-domestic buildings. The project will deliver the Bayesian building energy management portal based on Bayesian analysis and building energy simulation to provide adequate energy services to building occupants at minimum cost.

What is the aim of your project?

The ambition of the B.bem project is to transform conventional energy analysis processes in order to better support the future energy management of existing non-domestic buildings. In order to make sound decisions on future building operation and technology investment, a multidisciplinary analysis process is required to embody a good representation of existing building services and occupancy related operations as well as full economic analysis and the associated risks of various improvement options.

What approach did you take to address the challenge?

For capturing realistic occupancy and associated services in the simulation model, we have investigated different methods that parameterize internal loads with different assumptions and levels of complexity and worked on development of a new approach that can maximise confidence in the simulation output while minimising modelling efforts. In parallel, we have worked on development of a model calibration framework that utilises various sources of monitored data at different levels in order to reduce the performance gap.

How will this research have impact?

The B.bem project will develop and recommend an altogether new approach to performing building audits, simulation, uncertainty analysis, data visualization, and finally decision-making. It will lead to a marked reduction in the cost of acquiring information for robust retrofit and facility management decisions. This research work will address the formulation and use of building simulation models specifically for decision-making in existing buildings.

What are the next steps?

Development of the B.bem portal will be accomplished by the following major steps: (a) creating a new evidence-base for quantifying uncertain parameters in the energy analysis process for existing non-domestic buildings; (b) developing a computational framework for quantifying and managing uncertainties in the decisions; (c) exploring performance metrics and visualisation methods for the display and communication of uncertainties to user groups.

Ruchi Choudhary

E r.choudhary@eng.cam.ac.uk

C-Tech

Creating the Energy for Change (CTECH) is a five-year EPSRC-funded research project comprising of the University of Nottingham, University of Southampton, and the Centre for Sustainable Energy (CSE). The team brings together computer scientists, sociologists, psychologists, and practitioners of energy reduction, with the goal of reducing workplace energy demand through collaborative approaches.

What is the aim of your project?

As sensors become increasingly pervasive, and management software more sophisticated, new opportunities are emerging for reducing energy consumption in office environments. However technology advances do not, on their own, solve the problems of how to changing energy-using practices in organizationally-complex, shared spaces. CTECH's approach will demonstrate energy reduction in partner organisations through a series of interventions combining digital technologies with sociological and psychological insights.

What approach did you take to address the challenge?

CTECH is working with a host of organizations, both SME and large enterprises, public and private sector. Existing workplace energy management has been studied ethnographically, identifying the often contradictory goals that can result in seemingly irrational energy-using practices and policies. Several field trials of software and hardware have been conducted, focused on using lightweight sensing to create new feedback loops between building and occupants. Psychological experiments have explored underlying motivations amongst staff for reducing (or not!) energy use at work.

How will this research have impact?

Over the next two years CTECH is planning a series of extended, 'in the wild' studies in workplaces, in which we will introduce a suite of interventions, both technical and behavioural, and monitor the effects. Our goal, drawing on our work to date, is to turn workplace energy management from an activity conducted by facilities managers largely in spite of office employees and senior managers, to a cooperative process in which information systems and supportive organisational structures engage and involve occupants.

What are the next steps?

Current solutions in the market tend towards top-down, technology-focused solutions that, we argue, fail to address underlying tensions between the contradictory demands of different building users, and also lack independent analysis of effectiveness. CTECH's findings will be collated in a toolkit, which will demonstrate a holistic, socio-technical approach to reducing workplace energy demand.

Murray Goulden
Co-investigator
E murray.goulden@nottingham.ac.uk
W www.energyforchange.ac.uk

DANCER

Digital Agent Networking for Customer Energy Reduction

DANCER is an EPSRC funded research project involving the University of Essex, London Southbank University and the University of Southampton. We are a team of engineers, computer scientists, and behavioural scientists involved in the design and evaluation of an innovative home energy management system.

What is the aim of your project?

The DANCER project aims to develop an innovative home energy management system that will lead to a lasting reductions in energy consumption (and CO2 emissions) while still retaining desirable comfort levels and users' autonomy. This involves the creation of an intelligent system that not only extracts useful energy consumption data, but also automatically implements real-time changes.

What approach did you take to address the challenge?

The DANCER project recognises the pivotal role of end-users so the design of the system has been informed by observations gleaned from social science data. These include insights into domestic heating practises, and householder interaction with energy monitors. The system has been designed to gather information about occupants' energy consumption behaviours and energy related preferences which then inform the implementation of automated energy saving actions. The system also provides the end user with smarter controls and feedback about the costs of their homes appliances.

How will this research have impact?

Smart meters are paving the way for exciting new offers in energy management, such as self-learning systems that could be used to optimize a home's heating or switch off forgotten devices. DANCER's focus on automating energy savings will provide invaluable knowledge about whether automation could provide a means for householders to effortlessly curb their energy consumption. The DANCER project will also gain a deeper understanding about how energy is used in people's homes which can be used to identify future energy saving opportunities. Such information will benefit technology developers, policy makers or even householders looking to reduce their energy bills.

What are the next steps?

The crucial next stage for the DANCER project is to trial our system with householders so that we can evaluate its effectiveness. In trialling the system we will collect extensive data about how energy is used in homes and gauge householder acceptance of zonal heating. Findings from this trial will then be disseminated via academic publications, and at our own stakeholder event.

Riccardo Russo
Principle investigator
E rrusso@essex.ac.uk
T +44 (0) 1206 873872
W www.dancer-project.co.uk

Address
Department of Psychology
University of Essex
Colchester
CO4 3SQ, UK

DEFACTO

Digital Energy Feedback and Control Technology Optimisation

DEFACTO is a 5 year interdisciplinary research project being carried out at Loughborough University. The funding comes from the digital economy and energy programme which is a Research Councils UK cross council initiative led by EPSRC and contributed to by ESRC, NERC, BBSRC and STFC. The project brings together two of Loughborough University's world leading schools: Civil and Building Engineering & Design.

What is the aim of your project?

This interdisciplinary project calls upon expertise in domestic energy demand, statistics, modelling and user behaviour. Together with the support of commercial partners, the project will quantify the potential for new digital technology to reduce heating energy demand in homes.

What approach did you take to address the challenge?

In the first pilot phase two identical test houses were used to validate the models that will predict the energy savings from zonal heating control. In the second pilot phase the energy use in 12 houses was then monitored to test the data collection methods developed for the main DEFACTO study. In the main study 300 owner-occupied homes have been recruited from various geographical locations in the UK. The homes will be monitored for up to three years to obtain long term data about energy use. They will be split into three groups, which will receive different feedback and control systems.

How will this research have impact?

The project will provide an increased understanding of the effectiveness of different feedback and control devices for reducing energy demand, which will feed into improvements in the design for such devices. The project will also provide an in depth study of changes in energy demand and internal temperature and quantification of some of the errors in energy prediction models.

What are the next steps?

Monitoring equipment has so far been installed in almost 200 houses and data is being collected. All houses will undergo a survey (EPC) and participants will complete an initial questionnaire. Baseline energy consumption and temperature data will be collected prior to control changes for selected houses.

Kevin Lomas
Principle Investigator
E K.J.Lomas@lboro.ac.uk
T +44 (0)1509 222615
W www.defactohomes.com

Address
Building Energy Research Group
School of Civil and Building Engineering
Loughborough University
LE11 3TU, UK

ENLITEN

Energy Literacy Through an Intelligent Home Energy Advisor

ENLITEN is a multidisciplinary EPSRC-funded research project led by the University of Bath with inputs from the University of Oxford. The project brings together researchers from architecture and civil engineering, computer science, psychology, and electronic and electrical engineering.

What is the aim of your project?

ENLITEN's core mission is to find ways of improving household energy literacy and, through this, reduce home energy use.

What approach did you take to address the challenge?

We developed: a measure of population energy literacy through an interactive game (https://enlitengame.co.uk); new low-cost robust wireless sensors based on the Raspberry-Pi computer; a new household value-model that can be used to frame messages that appeal to individual households; an extensible software framework that automatically monitors sensor health; and finally an intelligent home energy advisor that combines the above features with a unique thermal model of each building to provide automated messages on how to reduce energy consumption without affecting personal thermal comfort. These methods and technologies have been tested on 65 homes, with final outputs expected end 2016.

How will this research have impact?

The expected cost of the UK smart meter rollout is around £11 billion, of which one component is the In-Home Display (IHD). ENLITEN hopes to transform how the IHD works through providing personalised actionable feedback to households in plain English. In addition, we expect to provide significant new insight into the state of energy literacy in the UK population, guiding future policy. Future work in this area will benefit from our open-source low-cost sensor platform as well as the long time series of energy and environmental data we have collected.

What are the next steps?

We aim to make all our outputs available to a range of end users in a readily re-usable form. We also intend to carry on expanding the current state of knowledge around energy literacy through the ENLITEN game. A number of smaller-scale experiments designed to test other aspects of our understanding of occupants, their behaviour in relation to and their understanding of energy use, are also planned.

Sukumar Natarajan
Co-investigator
E s.natarajan@bath.ac.uk
T +44 (0) 1225 386 358
W www.cs.bath.ac.uk/enliten

Address
Centre for Energy and the Design of Environments
Department of Architecture and Civil Engineering
University of Bath
Bath
BA2 7AY

eViz

Energy Visualisation for Carbon Reduction

eViz is an EPSRC funded research project which investigates how we can reduce energy demand in buildings by transforming people's understanding and behaviour through novel energy visualisations. The project brings together researchers from psychology, building sciences, computer science and data visualisation from the universities of Plymouth, Bath, Birmingham and Newcastle.

What is the aim of your project?

People play a key part in the energy performance of buildings, through design, operation control and management. eViz addresses an important challenge when designing tools aiming at energy conservation: the abstractness and invisibility of energy. eViz aims to change occupant behaviour through providing intuitive information that supports understanding and decision making. The project builds on the science of psychology and behaviour change, exploiting the importance of the human visual system.

What approach did you take to address the challenge?

A range of energy visualisation tools have been developed and tested, including a social media architecture, prototype energy feedback displays, an interactive virtual reality home and an energy simulation app prototype. We have also used thermal imaging extensively (in the field and in the virtual home) to visualise heat flows and shown that these result in householder actions.

How will this research have impact?

The research project has increased our understanding of how occupants interact with their home and how we can design effective energy visualisations that take into account the perceptions and knowledge that people hold. Some of the tools will be made publically available for use by environmental communicators, schools etc. eViz informs policy by providing recommendations for energy efficiency programmes that specifically build on insights into visualisation and behaviour change.

What are the next steps?

A follow-on research project is already underway: enerGAware, a 3-year European H2020 project that investigates serious gaming to help social housing tenants get on top of their bill. Our thermography work is also taken further by a collaboration between Plymouth University, the University of British Colombia and the City of Vancouver with studies planned for the near future.

Sabine Pahl
Principle Investigator
E sabine.pahl@plymouth.ac.uk
T +44 (0) 1752 584847
W www.eviz.org.uk

Address
School of Psychology
Faculty of Health and Human Sciences
Plymouth University
PL4 8AA, UK

Future FM

Future FM is an EPSRC funded research project based jointly in the Departments of Civil and Environmental Engineering and Chemical Engineering at Imperial College London. The academic team works closely with a set of project partners including Laing O'Rourke, Sainsbury's, Trend Control Systems and the Imperial College Estates.

What is the aim of your project?

The objective of the research is to answer the question 'How can novel data gathering and analysis strategies help facilities managers deliver future-proofed energy efficiency improvements across the non-domestic buildings sector?' The project will develop and demonstrate novel adaptive methods both to improve the energy performance of existing buildings and to ensure that these gains are preserved in the face of technological and societal change.

What approach did you take to address the challenge?

We shall use as test-beds for our work (a) a Sainsbury's supermarket, (b) buildings from the Laing O'Rourke portfolio and (c) buildings from the Imperial College Estate. These test beds will be used to evaluate our sensor network analysis, active management, optimised learning and incipient failure diagnosis methods. We will work with the partners to explore how these techniques can be rolled out effectively. Our collaboration with Trend is particularly important in this regard.

How will this research have impact?

Working with partners representing the education, commercial, and retail sectors, facilitates immediate impact to the energy management of their buildings and also enables the techniques developed to be sufficiently flexible for widespread use in other non-domestic buildings.

What are the next steps?

The project is currently in the process of merging unstructured data streams from stakeholder buildings, including security data at building access points, information from human resources on building occupants, digital meeting schedules, and weather data, for use in advanced adaptive control strategies. Methods are also being developed to leverage global sensitivity analysis to quantify uncertainties in building model inputs, allowing for reduced model complexity by identifying the most influential parameters.

Professor John Polak
Principle Investigator
E j.polak@imperial.ac.uk
T +44 (0) 20 7594 6100
W www.teddinet.org/projects/non-domestic/future-fm

Address
Department of Civil and Environmental Engineering
South Kensington Campus
Imperial College London
SW7 2AZ

IDEAL

IDEAL is an EPSRC funded research project based at the University of Edinburgh. Our team of computer scientists and sociologists are working together to explore the interaction between energy technologies and householder energy using practices.

What is the aim of your project?

Smart home sensing technologies offer the potential to provide enhanced feedback to householders about not just their total energy use, but tailored information about how much energy is used for their particular practices (heating, cooling, doing the laundry, etc.), and how they might reduce that, to support and encourage greater energy saving behaviour changes. We aim to advance the state of the art in this field.

What approach did you take to address the challenge?

IDEAL is using smart home sensing technology (including energy, temperature, humidity and light sensors), machine learning, and new feedback designs to construct an intelligent advice loop that will provide information to householders on what activities they are engaging in which use energy, and how much energy is used for each one, together with suggestions for what they might do to reduce their energy use. The system will be tested in a large trial of several hundred homes. The resultant data will enable us to evaluate the system's effectiveness and increase understanding of which factors influence people's response to innovative types of feedback.

How will this research have impact?

IDEAL is working to advance state of the art in low energy sensor systems, machine learning algorithms to disaggregate these data and identify the patterns of practices that use energy and their associated energy use, and feedback designs to provide this information to householders in a useful format. This will result in new methods for analysing diverse, parallel sensor data streams and the factors which influence energy use, and feedback. These outputs will be contribute to maximising the potential of the UK smart metering programme for technology developers, energy network operators, policymakers and homeowners.

What are the next steps?

IDEAL will continue to develop and evaluate the whole intelligent advice loop, producing academic publications and presentations across various disciplines. The project will also produce a corpus dataset for use by other researchers.

LEEDR

Low effort energy demand reduction

LEEDR was a 4 year project that investigated energy consumption in family homes. Completed in November 2014, 20 households participated over three years where a novel combination of Ethnography, user-centred design and engineering/data analytics was used to deliver tailored whole-house energy reduction information.

What is the aim of your project?

To understand how people live their lives in their home and to investigate the impact this has on energy demand and through this, to gain insights into energy demand reduction that has a minimal impact on family life.

What approach did you take to address the challenge?

We combined forensic monitoring with video re-enactment studies and workshop based thematic analysis. The monitoring provided gas and hot water consumption every second, power, activity and window opening every minute and temperatures every two minutes, for 18 to 24 months. Video re-enactment was used to explore life in the home, observing routines around making the home ‘feel right’, laundry, hygiene, digital media and cooking. Interview/workshop techniques were used to probe perceptions of routines and to explore their aspirations, motivations and desires.

How will this research have impact?

Understanding families, how they consume their energy (and critically) what that service means to them, will allow the development of better technologies to help engage, manage and reduce their demand in the future. In addition to published work: there is a video archive available at http://energyanddigitalliving.com ; Recruitment material are available at https://dspace.lboro.ac.uk/dspace-jspui/handle/2134/18528 ; Example feedback is available at : https://dspace.lboro.ac.uk/dspace-jspui/handle/2134/16860 ; and we are developing a toolkit in collaboration with Forum for the Future.

What are the next steps?

A new 2 year project ‘HOTHOUSE’ is investigating the role and impact of hot water production for demand side management. Continuing the LEEDR work, it operates in collaboration with the End Use Energy Demand Centres, taking a lead from iSTUTE. The project will continue the collaboration with Forum and deliver modelling insights to IEA-EBS Annex 66 on occupant behaviour.

Richard Buswell
Principle Investigator
E r.a.buswell@lboro.ac.uk
W www.leedr-project.co.uk

Address
Building Energy Research Group
School of Civil and Building Engineering
Loughborough University
LE11 3TU, UK

REFIT

REFIT is an EPSRC funded research project across three Universities: Loughborough University, Strathclyde University and the University of East Anglia. The project brings together a multidisciplinary team with expertise in building energy, user-centred design, social practice and ICT to study how smart homes can be used to reduce energy use.

What is the aim of your project?

Smart Home technology is increasingly present in our homes. Smart Homes can provide a range of services including safety, security, comfort, healthcare and energy management, and are seen by companies across the world as a potential new and emerging market. REFIT aims to identify how Smart Home technology can be used to help understand and reduce household energy demand and consumer energy bills.

What approach did you take to address the challenge?

20 homes were recruited for a real world pilot of smart home technology. Quantitative and qualitative data was collected in the homes before and after the installation of smart home technologies. The rich dataset that emerged has been used to understand how occupants adapt to new technologies, how smart home data can be used to improve the evaluation of energy efficiency retrofits, how smart heating controls can be improved and how smart meter data can be used to understand how occupants heat their home and spend their time.

How will this research have impact?

The Smart Meter rollout presents a new opportunity to increase our understanding about household energy use. The research conducted during the REFIT project will have significant impact by providing methods for the analysis and presentation of new data streams designed to encourage the uptake of retrofit measures. Technology developers will be able to use learning from REFIT to improve the acceptability and functionality of their products. Future services propositions which provide added value for occupants by using smart home data have also been developed.

What are the next steps?

The REFIT data set is a significant asset and analysis will continue over the coming months and years. This will lead to numerous academic publications in our respective fields. The project also aims to develop a prototype digital platform which will demonstrate some of the techniques developed during the project and showcase the extra value these can provide for household occupants.

Steven Firth
Principle Investigator
E S.K.Firth@lboro.ac.uk
T +44 (0) 1509 228546
W www.refitsmarthomes.org

Address
Building Energy Research Group
School of Civil and Building Engineering
Loughborough University
LE11 3TU

WICKED Working with Infrastructure Creation of Knowledge and Energy strategy Development

WICKED is an EPSRC funded research project based at the University of Oxford. Drawing on expertise in mathematical and computer modelling, energy metering, organisational behaviour, and property law, WICKED aims to unpick the knots that hinder retail sector energy management.

What is the aim of your project?

The retail sector is the largest commercial property sector and a vital part of the UK economy. Businesses in the sector are diverse, ranging from multinational corporations to small independent stores, with different physical, organisational, and legal infrastructures. Because of complex interdependencies between properties and stakeholders, energy management in the retail sector can be defined as a 'wicked' problem in that it resists quick fixes: solving one aspect of a problem may reveal or create other problems.

What approach did you take to address the challenge?

WICKED uses a socio-technical segmentation model to engage with partners—retailers, property owners, business groups, and energy advice companies— learn from real-world problems, and co-create solutions. WICKED investigates opportunities at multiple scales: (1) top-down analysis of big data (2) middle-out organisational research on energy management and leasing practices (3) new high-resolution bottom-up building-level data.

How will this research have impact?

WICKED enables change by developing new analyses to fit the needs of different decision-makers. Indicative early industry impacts include citations in company reports (e.g., M&S's Plan A 2015), websites (e.g., the Better Buildings Partnership), and invited presentations to partners (e.g., Savills) and related groups (e.g., the Retail Energy Forum). Insights for policy makers will be explored in three roundtables at Westminster, as well as a final academic/policy/industry event in London.

What are the next steps?

WICKED has published a number of papers in both academic venues and the trade press; initial findings have been presented across Europe, Asia and the United States. Supported by a NERC 'pathfinder' grant, two patent applications have been submitted for WICKED's 'smartphone monitor' invention. Where allowed by partnership agreements, data sets gathered in WICKED will be contributed to datasafes for onward analysis. Further partner engagement is anticipated; WICKED investigators are currently seeking funding to expand WICKED research to other sectors and stakeholders.

Kathryn Janda
Research Director
E katy.janda@ouce.ox.ac.uk
T +44 (0) 1865 285544
W www.energy.ox.ac.uk/wicked

Address
Environmental Change Institute
South Parks Road
University of Oxford
OX1 3QY

Innovate UK

Innovate UK is the UK's innovation agency. Our role is to fund, support and connect innovative British businesses through a unique mix of people and programmes to accelerate sustainable economic growth. The businesses we support range from pre-start-up and early-stage micro companies to larger corporates and multinationals.

We help companies take their ideas on the difficult journey to market by providing them with a powerful array of programmes and tools. Funding for research, development and demonstration projects ranges from proof of concept grants and feasibility studies to large multi-partner collaborative research and development projects.

During the year 2014-15 we opened a total of 104 new competitions for funding. Other resources include the network of Catapult centres, which are a major boost to the UK's ability to transform ideas into new products and services in specific fields. We also offer knowledge sharing opportunities for academia and business, facilitate networking to boost open innovation and provide the route for UK businesses to access European support for innovation and technology.

www.gov.uk/government/organisations/innovate-uk

Organisers

TEDDINET

TEDDINET is a network to support and promote the 22 TEDDI (Transforming Energy Demand through Digital Innovation) and BuildTEDDI (Transforming Energy Demand in Buildings through Digital Innovation) projects. This Research Council UK funded programme of research aims to explore of the opportunities afforded by ICT to improve energy demand reduction and energy management.

This opens the road not only to smart meters and smart grids, but also smart citizens who are more aware of their energy use and are acting on that information to reduce energy bills and energy wastage in their daily lives without compromising their health or wellbeing. The (Build)TEDDI projects support multidisciplinary teams in the development of digital technology and the exploration of how digital technology is actually adopted by society to affect behaviour change with regards to energy use.

Focused on creating a strong legacy for industry, Government and society, TEDDINET works by initiating and facilitating communication and collaboration within the (Build)TEDDI community, as well as externally between the (Build)TEDDI community and industry, policy-makers, civil society and other academics.

TEDDINET commenced in September 2013 and runs for 4 years.

www.teddinet.org

Knowledge Transfer Network

KTN Connects people to speed up innovation, solve problems and find markets for new ideas. Established to foster better collaboration between science, creativity and business, KTN has specialist teams covering all sectors of the economy from defence and aerospace to the creative industries, the built environment to biotechnology and robotics. KTN has helped thousands of businesses secure funding to drive innovation. And we support them through their business cycle to see that investment through to success.

KTN's Built Environment Community delivers the Innovation Network function for practitioners in the urban living sectors. It's a purpose build vehicle to bring the community sub sets together to share best practice, linking funders to finance seekers, inspire collaboration and showcase new opportunities for the UK's small businesses in this area. A wider mission is also to bring these businesses closer to the research bases, bigger tier operators and collaborative opportunities outside this sector.

www.connect.innovateuk.org/web/modernbuiltktn

Delegates

Asif Din
A2

Offering Low and zero carbon housing expertise, LCA and passive servicing strategies

Seeking Partners for CR&D projects, software UI support for new tool, sponsorship for dissemination and/or academic study

Email asifdin@hotmail.com

Ben Todd
Arcola Energy

Offering Arcola Theatre existing building (20,000) and planned future building (100,000sqft mixed use) as a testbed and showcase of Smart Building technologies. AND hydrogen fuel cell systems for Smart Building applications

Seeking Suppliers / partners to work with on building cutting edge Smart Buildings for Arcola

Email ben@arcolaenergy.com

Daniel White
Avalon Behaviour Venture

Offering Behavioural Scientists 1. Apply behavioural science 2. Apply causality and design randomised control trials 3. Advise on validity of behavioural insights

Seeking Organisations with the capacity to test interventions, with remote and revealed datasets that can be randomised

Email dan@avalonbehaviour.com

Cameron Steel
BK Design Associates

Offering As a building services design engineer I have knowledge of the practical implications and possible barriers to reducing energy demands in buildings

Seeking I am looking for innovative mechanical and electrical engineering solutions and potentially disruptive design philosophies for implementation in real world scenarios

Email cameron.steel@bkda.co.uk

Delegates

Niall Gibson
BRE

Offering The BRE Academy is the construction Industry's one stop shop for all training needs

Seeking Attending to meet delegates to resolve any training gaps within their business

Email gibsonn@bre.co.uk

Howard Brown
BSI Group

Offering Development of standards

Seeking Requirement for standards

Email Howard.brown@bsigroup.com

Jeremy Towler
BSRIA Worldwide Market Intelligence

Offering BSRIA World Market Intelligence offers a wide range of published research and consultancy for intelligent building technical infrastructures

Seeking Companies wishing to understand smart building market opportunities, market drivers, trends, sizes, players, sales channels and growth forecasts

Email jeremy.towler@bsria.co.uk

Rebecca Ward
Cambridge University

Offering Building energy simulation for non-domestic buildings, energy consumption analysis, retrofit analysis. Simulation of building integrated agriculture

Seeking Information concerning occupancy-related energy demand, the building energy manager's perspective

Email rmw61@cam.ac.uk

Delegates

Yeonsook Heo
Cambridge University

Offering Specialized in building performance modelling and simulation, with expertise in uncertainty quantification and risk assessment in the context of building energy retrofits

Seeking Seeks for knowledge and experience from other research projects on the role of occupants on building energy efficiency and key performance measures and visulation methods for energy management of buildings

Email yh305@cam.ac.uk

Karen Smith
Centre for Sustainable Energy

Offering Research experience with households in fuel poverty on giving energy advice informed by temperature and humidity sensors, and on use of smart PAYG IHD

Seeking Visualisation of information (not charts), fuel poverty and ToU tariffs, closing inequalities gaps through smart technologies

Email karen.smith@cse.org.uk

John Scott
Chiltern Power Ltd

Offering Knowledge of smart grids developments in the local power networks and the strategic directions that could be beneficial for smarter buildings

Seeking An update on trends in smarter buildings especially how we move to whole-system thinking and interoperability

Email john.scott@chilternpower.com

Delegates

Ian Govier
e2E Services Ltd

Offering Energy management solutions that enable communities to benefit by pooling resources to achieve lower electricity costs and a greener supply

Seeking Financial investment to commercialise the technology and relationships with community energy groups to trial and adopt the solution

Email iangovier@e2eservices.co.uk

Emmanuel Dupriez
EDF Energy

Offering Building energy data expertise

Seeking Connected homes projects, smart meters and smart thermostat analysis

Matthew Rhodes
Encraft

Offering Encraft uses its deep expertise in buildings and energy systems to help develop markets for smart building technologies. We provide project engineering and systems integration capabilities which give end customers the confidence to engage with innovative solutions and currently run a variety of demonstration projects

Seeking We're seeking innovative, market-ready technologies to include in pilots and market trials

Email matthew.rhodes@encraft.co.uk

Liz Reason
Green Gauge Trust

Offering Ability to help clients understand what a smart building is in practice rather than theory

Email liz.reason@greengaugetrust.org

Delegates

Dan Jestico
Hilson Moran

Offering Sustainability consultancy and research services. Focussing on assessment of energy demand and consumption through auditing and modelling

Seeking Data on operational energy consumption, evidence of demand reduction potential, demand reduction services for speculative developments

Email djestico@hilsonmoran.com

Chris Slezakowski
Insulation and Energy Management

Offering Expertise in energy performance calculations and material selection

Seeking Partners to drive energy efficiency improvements in existing buildings

Email cms@sigplc.co.uk

Alastair Ramsay
Legrand Electric Ltd

Offering Experience of especially residential building systems providing solution links between comfort, convenience and control of energy while incorporate help to those with assisted living needs

Seeking Wider understanding of user needs to deliver better use of energy

Email Alastair.ramsay@legrand.co.uk

Mohammad Ghavami
London South Bank University

Offering Digital Agent Implementation using UWB Radar and Wireless Sensor Networks for Customer Energy Reduction

Seeking Advanced and Optimised Sensor Network Control Algorithms for Collaborative Energy Saving

Email ghavamim@lsbu.ac.uk

Delegates

Kerstin Leder-Mackley
Loughborough University

Offering Ethnographic insights into energy consumption, hot water use and everyday digital media use in the home

Seeking Expertise in smart futures work that incorporates both socio-economic and technological trends, and links to energy and hot water consumption

Email k.leder@lboro.ac.uk

Stuart Cockbill
Loughborough University

Offering Expertise and research examples of using creative, participative design approaches to design energy feedback and future service propositions

Seeking To engage with others who are working with creative, participative design approaches with the energy-saving and retrofit sector

Email s.cockbill@lboro.ac.uk

Marouane Azennoud
Northamptonshire County Council

Offering Business card and update of the smart county platform of Northamptonshire County Council

Seeking Discovering the new ways/systems to manage energy consumption at the demand side

Email mazennoud@northamptonshire.gov.uk

Ramon Granell
Oxford e-Research Centre

Offering Analysis of smart-meter energy data using data mining and machine learning techniques: results interpretation and ML models

Seeking Which models are researchers using to analyse energy data? To solve which problems? Are the same problems energy managers have?

Email ramon.granell@oerc.ox.ac.uk

Delegates

Nigel Orchard
Pilot Smart Metering

Offering Pilot Systems are actively developing the SMETS smart meter specification.

Seeking Any business not yet engaged in the Smart Meter program but would like to be

Email nigel@pilotsystems.com

Paul Maryan
Ricardo

Offering A new top down approach to building energy demand based on a signature analysis method

Seeking Anyone interested in this approach

Email Paul.maryan@ricardo.com

Sarah Davis
Skills4Stem Ltd

Offering Technical & Non-Technical skills analysis, mapping & training for the Built Environment through Gamification (mobile software based technology)

Seeking Insight into what skills may be in demand in the future & how people will interact with smart buildings and cities

Email sarah@skills4stem.co.uk

Robert Erskine-Murray
SMS Plc

Offering We are an energy management and metering company with live sites, exploitation experience and EU project experience.

Seeking Technical partners in projects

Email Robert.Erskine-Murray@sms-plc.com

Delegates

Stephen Pattenden
Telemetry Associates Ltd

Offering Telemetry Associates Ltd. and SH&BA have been working on the premise that only through industrial scale refurbishment can the UK meet 2050 targets

Seeking An opportunity to establish a major project in this area so that there is visibility of what can be done

Email telemetra@telemetra.com

Paul Bicheno
The Institution of Engineering and Technology

Offering Insight into the key projects that the IET are working on related to the topics of energy efficiency and management

Seeking Wider understanding of the issues and good practices associated with effective energy efficiency and energy management within the built environment

Email pbicheno@theiet.org

Martin Pullinger
University of Edinburgh

Offering Expertise in analysing building sensor data to understand effects of city and household-level influences on domestic energy demand. Currently evaluating energy feedback designs

Seeking Policy, planning and industry partners for research into improving smart building energy performance through behaviour change

Email martin.pullinger@ed.ac.uk

Nigel Goddard
University of Edinburgh

Offering Expertise in research into analytics, feedback and control methods for smart buildings. Currently running projects in households and public sector buildings.

Seeking Industry partners for research into real-world smart building controls, particularly analytics and user-centred user interfaces.

Email nigel.goddard@ed.ac.uk

Delegates

Sam Staddon
University of Edinburgh

Offering I am Network Co-ordinator of TEDDINET, thus I offer an overall picture of the the network and its reach

Seeking To understand the needs of industry, policy and practitioners in building energy demand to help target the work of TEDDINET

Email sam.staddon@ed.ac.uk

Argyrios Zolotas
University of Lincoln

Offering Expertise on Advanced Control Methods; Sensor Optimisation for control and fault tolerance in applications incl. Power System Networks and Transportation; Economic plantwide control

Seeking State of the art of Smart Buildings; Sensors/Effectors within Buildings; Understanding of Smart Buildings as Sensors; Management objectives. Networking and consortia possibilities

Email azolotas@lincoln.ac.uk

Murray Goulden
University of Nottingham

Offering Information on Creating the Energy for Change (CTECH) EPSRC project, five year study on reducing energy use in workplace

Seeking Those with experience of combining social/organisational and technical approaches to workplace energy reduction

Email murray.goulden@nottingham.ac.uk

Gary Middlehurst
University of Reading

Offering Solutions for the adoption of direct current (d.c.) power for future intelligent workplaces and ICT data Centres

Seeking Current marketing intelligence and further research funding opportunities

Email g.middlehurst@pgr.reading.ac.uk

Delegates

Li Shao
University of Reading

Offering Energy and people occupancy monitoring in non domestic buildings

Seeking Lessons learned / insights of success or otherwise of energy monitoring and management in non domestic buildings

Email l.shao@reading.ac.uk

Lina Stankovic
University of Strathclyde

Offering Presenting the findings of EPSRC REFIT project, w.r.t personalised advanced energy services dynamically determined from on-line analysis of smart meter data

Seeking How to develop of our research work to best engage with commercial entities, such as utilities, smart home tech providers, energy feedback consultants

Email lina.stankovic@strath.ac.uk

Vladimir Stankovic
University of Strathclyde

Offering Real-time energy monitoring solutions from EPSRC REFIT and APAtSCHE projects inc. smart sensing, data management and processing, energy disaggregation, appliance mining and feedback

Seeking To join trials on residential or business energy monitoring; exchange ideas on energy disaggregation and appliance mining tools

Email vladimir.stankovic@strath.ac.uk

Matthew Gross
University of Sussex

Offering An understanding of residential consumer interest in participating in demand response programmes

Seeking To develop an understanding of approaches that make it easier and more motivating for consumers to make changes to electricity consumption practices

Email m.j.gross@sussex.ac.uk

Delegates

Estelle Littlewood
Verve Architects

Offering Knowledge of how to adapt building design to cope with the impact of future climate change

Seeking Delivery of innovative sustainable buildings through advances in design technology and construction

Email Estelle@vervearchitects.com

Neill Ryan
VRM Technology

Offering VRM Technology Limited (VRM) has developed a Software-as-a-Service (SAAS) technology “Refurbify” that enables all constituents in the construction life cycle to seamlessly interact

Seeking We are looking towards a new funding round next year and are seeking potential investors to participate

Email neill.ryan@vrmtechnology.co.uk

Tom Gwyn
XCO2 Energy Ltd

Offering Building services engineering, energy & sustainability consultancy; and building performance evaluations

Seeking Opportunities in building performance design, centred around innovative approaches in new and existing buildings

Email Tomg@xco2energy.com

Russell Haggar
Xsilon

Offering Low cost reliable connectivity for sensors and appliances inside smart buildings

Seeking Funding for productisation and new commercial partners

Email russell.haggar@xsilon.com

Delegates

Christopher Weeks

Offering Completed a large amount of research on customer engagement, especially around getting householders to retrofit their property and the role that digital technology can play.

Seeking People that are interested in the role digital technology play when it comes to sustainability, especially in the domestic energy market.

Email mrcweeks@gmail.com

George Stevenson
ActivePlan

David Ross
AECOM

Judit Kimpian
AHM

Panchadeep Nath
Amey

John Epps
Andritz Hydro

Vicky Hayman
ARCC network, UKCIP

Declan Sherry
Artis PC

Delegates

John Lohan
Artis PC

Faith Wainwright
ARUP

Joe Miles
Atamate Ltd

Philip Hargreaves
BE

Howard Porter
BEAMA

Yselkla Farmer
BEAMA

Lubo Jankovi
Birmingham City University

Gibb Barron
BIS

Mike Hartley
BMS Home

Delegates

Rowan Hargreaves
BMS Home

Ioana Pisica
Brunel University

Mizi Fan
Brunel University

Peter Tse
BSRIA

Rod Bunn
BSRIA

Richard Lorch
Building Research & Information

Peter Hancock
Carbon Values

Peter Martin
Carbon Visuals

KC Chan
Causeway Technologies

Delegates

Neil Campbell
ChapmanBDSP

Sinisa Stankovic
ChapmanBDSP

Pete Cunningham
Chemquip ltd.

Anastasia Mylona
CIBSE

David Jones
Construct Sustain

Mark Gaterell
Coventry University

Shuli Liu
Coventry University

David Fallon
covercare

John McAvoy
Cybula

Delegates

Tom Jackson
Cybula

Mark Lemon
De Montfort University

Richard Bull
De Montfort University

Craig Lucas
DECC

Jeremy Vincent
DECC

Michael Harrison
DECC

Yehuda Lethbridge
DECC

Mark Henley
Demand Logic

Terry Clapp
Dow Corning Ltd.

Delegates

Trevor Beard
E2E Services

Jacopo Testa
EDF Energy

Thibaut Possompes
EDF Energy

Alastair Byrne
EDF Energy R&D UK Centre

Andrew Spencer
EFA

Richard Daniels
EFA

Bill Wright
Electrical Contractors' Association

Andrew Jones
Empirical Energy Ltd

Sarah Blois-Brooke
Encraft

Delegates

Michael Bambrick
EnerGenius

Paddy McDonald
EnerGenius

Ben Hughes
Energy 2050, The University of Sheffield

Benjamin Kott
Energy Deck

Nic Mason
Energy Deck

Damian Coulton
Energy Saving Trust

Geoff Stevens
Energy Saving Trust Enterprises Limited

Julian Roberts
Energy Saving Trust

Stephen Loveridge
Energy Technologies Institute - Smart Systems and Heat

Delegates

Nirmal Laddha
EntireFlow Technologies Ltd

Swati Rathi
EntireFlow Technologies Ltd

Stuart McKinnon
ETI

Alistair Cory
Gensler

Trevor To
Gensler

George Martin
George Martin Consulting

Duncan Botting
Global Smart

Edward Owens
Heriot-Watt University

Michael Danson
Heriot-Watt University

Delegates

Salvador Acha
Imperial College London

Dwight Wilson
Imtech UK

Mark Thompson
Innovate UK

Mat Colmer
Innovate UK

Rick Holland
Innovate UK

Sarah Walker
Innovate UK

Simon Hart
Innovate UK

Edwina Cramp
Integrated Environmental Solutions Limited

Naghman Khan
Integrated Environmental Solutions Limited

Delegates

Shane Campbell
Integrated Environmental Solutions Limited

Toby Sortain
ISG Plc Fitout

Lee Gould
Kinberry Limited

Bruce McLelland
KTN

Chris Bagley
KTN

Daniella Melandri
KTN

Jenni McDonnell
KTN

Mike Mosley
KTN

Natasha Sim
KTN

Delegates

Richard John
KTN

Valeria Branciforti
KTN

Justin Hopkins
KTN Journalist

Andy Ford
London South Bank University

Andrew May
Loughborough University

Arash Beizaee
Loughborough University

Becky Mallaband
Loughborough University

Dashmir Marini
Loughborough University

David Allison
Loughborough University

Delegates

Ehab Foda
Loughborough University

Lynda Webb
Loughborough University

Richard Buswell
Loughborough University

Roxana Morosanu
Loughborough University

Stephen Porritt
Loughborough University

Steven Firth
Loughborough University

Tarek Hassan
Loughborough University

Tom Kane
Loughborough University

Val Mitchell
Loughborough University

Delegates

Vanda Dimitriou
Loughborough University

Johnny Chan
Mathalope

Jeremy Whitlock
me-engineers ltd

Lucy Jane
Metric Digital

K M Szajdzicki
ND Metering Solutions

Cliff Willson
NEF

Luke Smith
NEF

Harry Armstrong
Nesta

George McGhee
NetThings

Delegates

Joe Tah
Oxford Brookes University

Rajat Gupta
Oxford Brookes University

Craig Webster
Pavegen Systems

Laurence Kemball-Cook
Pavegen Systems

Azad Camyab
Pearlstone Energy Ltd

Christine Boomsma
Plymouth University

Mike Phillips
Plymouth University

Sabine Pahl
Plymouth University

Max Munoz
QMUL

Delegates

Robert Foster
Queen Mary University of London

Sree Nanukuttan
Queen's University Belfast

Philip Jackson
Radius Regeneration Ltd

Sarah Lewis
RTPI

Venugopal Tatikunta
Save Entry Ltd

Aimee Ambrose
Sheffield Hallam University

Kristian Limpert
Sheppard Robson

Ian Ellis
Siemens

Ping Wu
SinoEuropeanLink

Delegates

Kudzai Mungate
Skanska

Barry Clive
Solar Transmuter ltd

Anne Stokes
Steamwire

Robert Klaschka
Sumo Services

Judith Ward
Sustainability First

Richard Lupo
Sustainable Homes

Ben Miller
SVDP /Canary Control

James Byrne
SVDP /Canary Control

Michael Sharratt
TerOpta

Delegates

Paul Callan
TerOpta

Dan van der Horst
The University of Edinburgh

Johanna Moore
The University of Edinburgh

Kate Carter
The University of Edinburgh

Kimberley Steed German
UCL

Mark Burgess
UCL

David Shipworth
UCL Energy Institute

Adam Cooper
UCL STEaPP

Rose Luckin
University College London

Delegates

Mohammed Imbabi
University of Aberdeen

Julian Padget
University of Bath

Nataliya Mogles
University of Bath

Sukumar Natarajan
University of Bath

Kathrin Menberg
University of Cambridge

Kathryn Buchanan
University of Essex

Riccardo Russo
University of Essex

John Counsell
University of Liverpool

Katy Janda
University of Oxford

Delegates

Zhiwen Luo
University of Reading

AbuBakr Bahaj
University of Southampton

Bruce Stephen
University of Strathclyde

John Allison
University of Strathclyde

Stuart Galloway
University of Strathclyde

Jean Waring-Thomas
Utilitywise

Mike Gough
Walden O'Neill

Kerry Frost
Watering Pipe Ltd

Mark Smith
Wattstor

Mike Baker
Xsilon

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Telephone: 01793 442 700
Email: support@innovateuk.gov.uk
www.innovateuk.gov.uk
support@innovateuk.gov.uk

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