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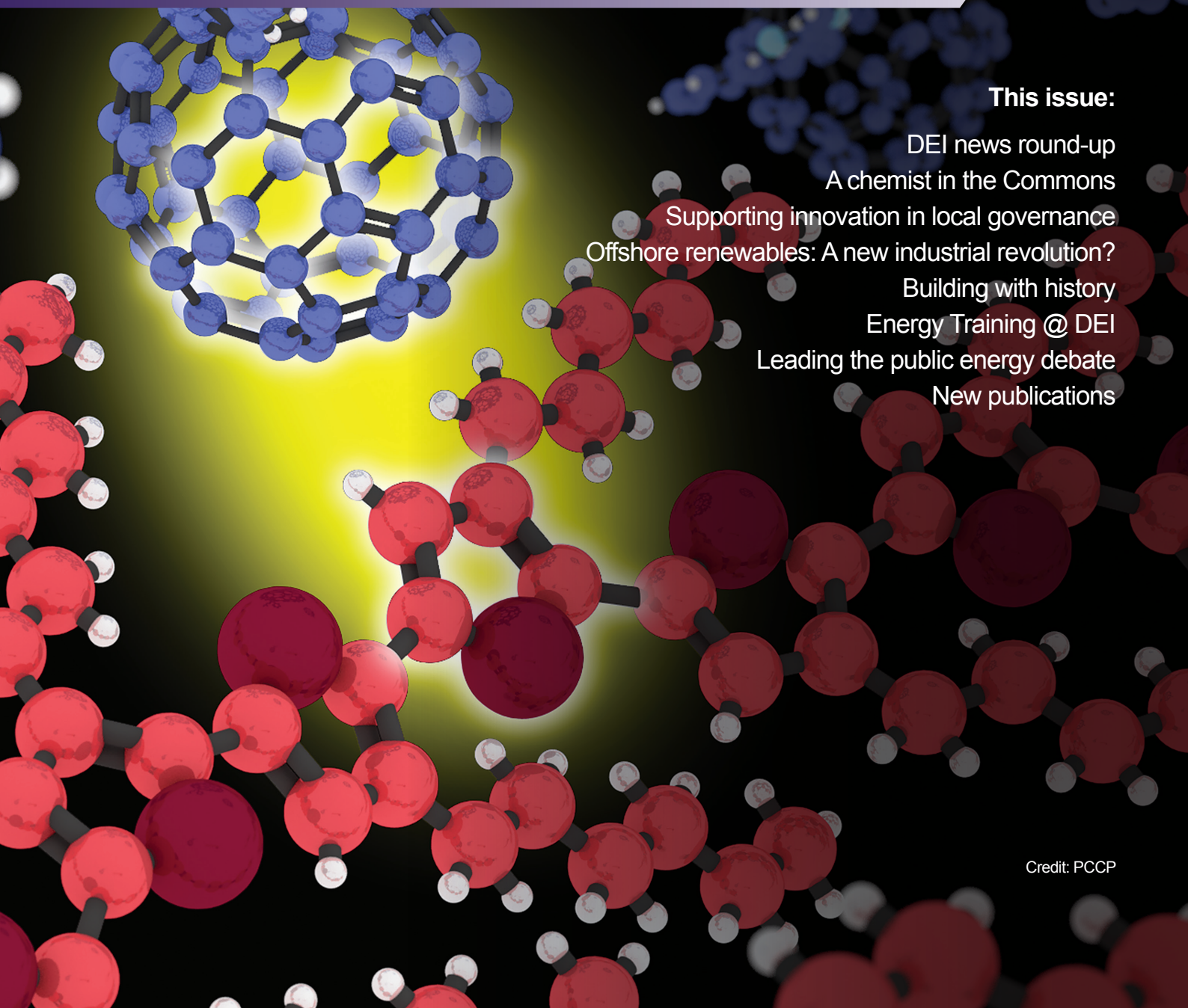
Durham Energy Institute Review



This issue:

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A message from the Executive Director of the DEI

Since the last issue of the magazine, the DEI has been successful in making good progress on several of this year's strategic aims.

Strengthening our international reputation and relationships is a major focus of the strategy and the last few months have seen significant activity in relation to this. We are building strong links with energy research organisations across the globe including UC Dublin, Rice University and University of Alberta, as well as supporting visits to Holland, China, Japan, Mexico, India, Italy and Norway to explore and advance new research collaborations. All of this activity bringing our longer-term vision of an international alliance of energy institutes closer to fruition.

We are delighted that Geoff Williams has joined the team as consultant to support DEI researchers with large grant capture. In recent months he has been energetically engaged in supporting our researchers with a number of proposals in response to Horizon 2020 and TSB funding calls. During this period we have enjoyed some successes with applications that have been supported by DEI. For example, the H2020 SmarterEMC2 proposal has been favourably evaluated and will be launched soon once the partnership agreement has been put in place. Congratulations go to Dr Hong Sun from Engineering who leads Durham's involvement in this consortium.

Our outreach activities aimed at promoting business links and influencing policy makers continue to gain momentum. The DEI is in the process of developing a number of policy briefs on Durham's energy research. These summary documents are aimed principally at creating impact from DEI research, by presenting key findings in a form that can be read and understood by non-specialists. The intention is to use the documents to increase the visibility to industry and policymakers of the important new insights emerging from Durham's energy research. For example, a policy brief by Dr Charlotte Adams from Earth Sciences on UK geothermal energy resource, was used recently in a meeting with Lord Jenkin in Westminster. This formed part of his preparations for a Lords debate on amendments to an Infrastructure Bill on exploitation of shale gas deposits and to geothermal sources. We have also been fostering strong research links with business and policymakers through research showcase events around the country. This has provided the opportunity for our researchers to meet directly with business leaders to update them on the latest research findings and to explore opportunities for enhancing innovation through collaboration. We are planning to bring the roadshow to Westminster in the coming calendar year.

We are in the process of developing strong working partnerships with regional local enterprise partnerships and local authorities, in particular Durham County Council and Haringey Council. A number of exciting initiatives are emerging, ranging from low-carbon innovations at the community level to developing wider visions which promise to position our region at the forefront of energy research and innovation.

Finally I hope that all our readers have been able to attend at least one of this year's many DEI events. My particular favourite was the 'Elect Your Energy Future' debate organised by our Energy CDT students. They did a fantastic job in combining an informative exhibition with an exciting debate on future energy options, including interactive voting and Twitter and the opportunity for the public to put their questions to a panel of representatives from the main political parties. Particular thanks go to Prof. Jon Gluyas for doing such an excellent job as Chair. More exciting events are planned for 2015.

Simon Hogg
Executive Director, DEI and DONG Energy Chair of Renewable Energy

DEI News

New members of the DEI community

New DEI Co-Director joins the team

Dr Simone Abram recently joined the DEI Executive as Co-Director of Social Sciences & Health. She is a member of the Department of Anthropology at Durham and has a background in power engineering. Her focus is on relating different disciplinary perspectives on energy and society, including the governance of energy developments, recent transformations of energy markets and the changing social and political significance of energy. Simone is also the Director of DEI's MSc in Energy and Society.

New DEI Advisory Board members

Ignacio Marti is Innovation and Technical Director at Narec, now known as the Offshore Renewable Energy Catapult. Ignacio has 20 years of experience in renewable energies with special focus on wind energy. He has a wide expertise in leadership of research groups, R&D management and international research strategic planning, including participating in more than 10 EU R&D projects since 1995. He participates in a number of international committees related to wind energy including Wind Energy Technology Platform (TPWind) and the International Energy Agency Wind (IEA-Wind).

Paul Brettwood is VP of Technology and Strategic Marketing at ION Geophysical, a leading technology-focused seismic solutions company. He has over 30 years of international experience in various seismic technology roles with Halliburton Geophysical, ABG Exploration and ION Geophysical.

Wilf Wilde was the Executive Director of the DEI in 2013, where he helped appoint the present executive team and looked to involve the DEI in global energy and policy developments. Prior to this he had a varied career in the oil industry, in the City and latterly as Marketing Director at the energy regulator, Ofgem. He worked at Exxon/Mobil for three years before working in equity stockbroking for 12 years.

New DEI grant capture consultant

Professor Geoff Williams is supporting our researchers to identify and access large funding opportunities. He has extensive experience of evaluating European and national grant applications and pulling together successful consortiums. Geoff is an internationally recognised industrial expert in solid state lighting (ssl) technology and sits on several influential technology-focused bodies. He advises various organisations on integrated green emerging technologies for intelligent environments and has extensive links within the energy sector.

Other news

Dr Natasha Shirshova joined the School of Engineering and Computing Sciences in September 2014 as Lecturer in Engineering Materials. Her research interest is in functional polymers and polymeric materials for various applications, including porous polymers for energy storage applications and a feasibility study of using environmentally friendly and sustainable resources oils and processes for the development of energy storage devices.

Professor Simon Hogg has been appointed as the new DONG Energy Chair of Renewable Energy at Durham University. The post is part of the continuing collaboration between DONG Energy and Durham University in renewable energy research. Working as Director of the Durham Energy Institute and Chair of Renewable Energy, Professor Hogg brings a depth of experience to the roles. His background is in mechanical engineering with specific expertise in analytical, experimental and computational fluid dynamics, turbo machinery, aerodynamics, thermodynamics and heat transfer. He also has a detailed knowledge of the mechanics of wind turbines.

DEI, represented by Prof Tooraj Jamasb, has become a member of the All-party Parliamentary Group on Energy Costs. The purpose of the group is to promote evidence-based discussion on all aspects of energy costs; to inform energy policy decisions and public debate; and to enable communication between interested parties and relevant parliamentarians.

Leading the public energy debate

Over the past few months DEI has hosted a number of exciting events which have engaged a wide range of people from industry, policy, the community sector and the general public. Here are summaries of just some of the events we have held.

To read a summary or view a video of any of our events go to www.dur.ac.uk/dei/events/past.events/

Elect Your Energy Future

On 21st August 2014, research students from the DEI Centre for Doctoral Training (CDT) in Energy hosted an evening debate on the future of energy policy in the UK. The event, chaired by Professor Jon Gluyas, sparked often fiery clashes between representatives of five of the largest UK political parties; James Wharton MP from the Conservative Party; Liam Carr from the Labour Party; Cllr Wendy Taylor from the Liberal Democrats; Jonathan Arnott from UKIP; and Jonathan Elmer from the Green Party. The event itself was an overriding success, with over 180 people in attendance from a cross-section of local and national industry, academia and pressure groups.

Before the debate, audience members were asked to vote down an energy technology in a 'reject a tech' ballot. In this, coal and fracked gas were overwhelmingly rejected as future energy sources. Some discontent was expressed towards nuclear and renewables, but this was minor in comparison to the strong opposition to fossil fuel.

The debate itself provided an opportunity for members of the public to directly quiz these political figures with questions focusing on energy efficiency, fracking, energy bills and renewables policy. There was even a rare flutter of unanimity and harmony amongst the panelists in agreeing the need to improve the energy efficiency of our homes. However, political point-scoring soon occurred with Labour and the Conservatives clashing on energy prize freezes and the record of the current coalition Government and the previous Labour regime.

After the debate, the public were asked to vote on the party which they felt best represented their 'energy future'. In contrast to national electoral ballots, the Green Party were chosen by the public with the Conservative Party in second place. Will this trend affect parliamentary election results next year? The DEI and CDT look forward to hosting similar events in the future to begin to answer that very question.

The Twitter contribution

Follow the panelists on twitter **@DEI_Durham, @Jonathan_Elmer, @jameswhartonmp, @JonathanArnott, @LiamRCarr, @NewcastleCC**

Excerpts from the twitter discussion:

- 'On the fence' voting on climate policy. Interested to see what points **@jameswhartonmp** debates at **#electenergy**
- **@DurhamEnergyCDT: @Jonathan_Elmer of @TheGreenParty** arrives in style on his electric bike
- **#GreenParty** supports re-nationalisation of electricity distribution system **#electenergy @Jonathan_Elmer**
- **Q:** Short vs Long term. Companies will not develop renewables when there's no market until 20-30 years' time. **#electenergy**
- Tough decisions to make - not everyone will like them - but need to be serious abt future of our energy policy **@jameswhartonmp #electenergy**
- Barbara Vest (Energy UK) – What energy journey are we going to go on, and how much is that going to cost? We need a clear energy policy
- Cllr Wendy Taylor thinks energy security, low-carbon energy and low-cost energy are all interlinked **#electenergy**

Modelling and Policy Making

The 'Modelling and Policy Making' workshop was supported by Durham Energy Institute and formed part of the Institute of Advanced Studies (IAS) 'Tipping Points in Modelling' seminar series. It aimed to discuss current and arising modelling challenges in large complex systems, and the use of models in decision and policymaking.

The speakers, who came from around the country, addressed important questions related to how models relate to the real world, how different user groups have different expectations of what a model can tell us, and how models are used by decision makers once they are developed.

Issues raised by the presentations and discussion included:

- The importance of managing uncertainty in the relationship between computer models and real systems, and the promise of Bayesian statistics, in which all uncertainties are represented as probability distributions, as a framework for decision making under uncertainty;
- The difficulties of communicating statistical modelling results to a broad non-specialist interested audience (ranging from public policymakers to the media and wider populace);
- The need to understand the risk associated with the model assumptions;
- The importance of users understanding the principles and limitations of the models in use and ensuring this is communicated to the clients by model developers; and
- The benefits of models in supporting Government to understand the impact of future policy.

Some of the issues raised at the workshop will be taken forward at Durham by Amy Wilson, Chris Dent and Michael Goldstein as part of the EPSRC project 'Uncertainty analysis of hierarchical energy system models: models versus real energy systems'. An Institute of Advanced Study and DEI seminar series is also planned for next year focusing on Evidence in Policy.

Geothermal launch

BritGeothermal

The Fourth London Geothermal Symposium formed the platform for the official launch of BritGeothermal; a multi-institutional research partnership comprising Durham University, the University of Glasgow, Newcastle University and the British Geological Survey. Held at the Geological Society in London on Oct 13th 2014, the conference provided the perfect springboard to launch BritGeothermal to academia, industry and government.

The conference opened with keynote presentations from Graham Allardice (DECC) who spoke about implementing Government strategy with respect to geothermal energy with a particular emphasis on geothermal heat. This was followed by Michael Feliks (Cluff Geothermal) who spoke about the medium-term vision for geothermal energy uptake. A wide variety of talks followed, the first session reported on the current research activity of BritGeothermal;

- Informative talks regarding the Eastgate and Science Central boreholes.
- Using co-produced hot water from existing oil fields as a geothermal resource.
- The potential of warm water within abandoned mines.
- Research into developing a city-scale geothermal simulation tool.

Subsequent sessions were provided by a wide range of speakers which varied from looking to the future of power generation within the UK (more specifically Cornwall), learning lessons from other countries, heat delivery options and new exploration strategies and technology. Case studies for several District Heating schemes around the country were provided by various speakers. Heat networks were discussed in more general terms by Mike Smith of Cofely, exploring the characteristics that define a successful scheme.

Jon Busby also led a session on International Energy Agency Geothermal Implementing Agreement (IEA-GIA). The GIA provides a framework for international knowledge exchange amongst countries and organisations active within the IEA by offering small amounts of funding for collaborative R&D projects. The question of risk and uncertainty within the context of attracting investment into deep drilling projects in the UK formed an ongoing discussion thread throughout the day. Ways in which to reduce upfront risk by better characterising geothermal systems were discussed and the final set of presentations highlighted new and emerging technologies. The case for vertical single-well boreholes was put forward by Ryan Law of Geothermal Engineering Ltd; utilizing this method of geothermal installation reduces the number of geothermal wells required and could provide a viable alternative for wells with little water flow. Town Rock Energy Limited, Adrok Ltd, Oxford University and the British Geological Survey (BGS) all provided talks based around other novel ways of non-intrusive geothermal resource prospecting and assessment. Most of the presentations are available with the authors permission at **www.britgeothemal.org.uk**

Read the DEI Geothermal policy brief which it outlines the potential of Geothermal as an energy and heat source in the UK at: **www.dur.ac.uk/dei/resources**.

Energy Savings Opportunity Scheme [ESOS] national launch

DEI was a partner in the launch of the Government's new Energy Savings Opportunity Scheme (ESOS) in the North East. Durham was the first authority in the country to stage the Department for Energy and Climate Change's (DECC) energy efficiency roadshow for large businesses. The event continues the close collaboration between DEI and Durham County Council which has been focused on bringing innovative energy and low-carbon projects to the county.

ESOS is a new mandatory regulation affecting all large businesses across the UK with more than 250 employees, or with an annual turnover in excess of £50 million and an annual balance sheet in excess of £43 million.

The launch was attended by more than 60 of the region's biggest businesses and was an opportunity to learn more about ESOS, to express their views on the scheme alongside the wider UK energy policy and to learn about various methods of financing energy efficiency projects. Simone Abram (DEI Co-Director), and Jacki Bell (DEI Impact Officer) were in attendance to help facilitate the events workshops.

Other partners in the event included NorthEast Enterprise Partnership, Tees Valley Unlimited, North East Chamber of Commerce, CBI and Durham County Council.

Links with Government

A Chemist in The Commons: A report from Jack Rowbotham, Energy CDT student

From January to April this year I made the move from lab to lobby, spending three months working for the House of Commons as a Royal Society of Chemistry (RSC) Westminster Fellow.

These fellowships typically place a PhD researcher into the Parliamentary Office of Science and Technology (POST) – Parliament's in-house source of timely, accessible and apolitical scientific information – to work on a POSTnote – a short, peer-reviewed policy-relevant briefing document. Though I'm sure I would've enjoyed working on a POSTnote (and, indeed, encourage anyone interested in science policy to peruse the POSTnote archive) I was extremely fortunate to have spent my time as a Westminster fellow not with POST but as a Specialist working with the Commons Energy and Climate Change Select Committee. Here, my experiences as a member of the DEI Centre for Doctoral Training in Energy (CDT) proved invaluable as I provided technical advice to the members of the Committee (currently chaired by Tim Yeo MP) as they went about their inquiries.

It was admittedly both exciting and daunting in equal measure to be pottering around the lab in Durham on one day and strolling the corridors of power the next! My first morning saw me sitting opposite the bosses of the Big Six energy companies as they explained, apologised, and, on occasion, flapped about the widespread power outages suffered by millions of customers as a result of last winter's extreme weather. Analysing these sorts of issues is at the heart of the work of the Committee and their role as scrutinisers of publically answerable bodies (including the Government) plays an integral part in upholding the accountability of our modern parliamentary system. To accomplish this task effectively, the Committee members need rapid, impartial, clear and understandable advice so that they can obtain the evidence they need to make conclusions and recommendations. Here, the Committee Specialist is a key figure, with the preparation of briefing documents prior to oral evidence sessions being a vitally important responsibility – and arguably one of the most exciting. It would be disingenuous of me to pretend that I didn't feel an ego-inflating sense of gratification to watch a Minister of State for Energy fumbling to adequately fend off a Committee grilling of my own drafting.

Behind the very public persona of the Committee, most famously embodied by the televised 'horseshoe' oral evidence sessions, there comes the much more academically demanding task of sifting through swathes of evidence and utilising it in the synthesis of a published report (to which the Government must respond). My principal task whilst in Parliament was to draft a report examining the latest scientific findings of the International Panel on Climate Change (IPCC) as published in the 5th Assessment Report (AR5) for which DEI's Prof. Harriet Bulkeley, was one of the authors on two chapters.

The IPCC AR5 is the most exhaustive and comprehensive assessment of the state of the climate and climate science to date, and it provides a reinforced scientific underpinning for policies aimed at mitigating the effects of anthropogenic climate change. Because of the importance of AR5 for policy, our inquiry aimed to scrutinise the degree to which it could be considered to be a well-balanced, scientifically inclusive, accurate, robust and reliable document. Our inquiry found little cause for concern in the work of the IPCC and applauded AR5 as a monumental achievement of the scientists involved.

The heavily technical nature of the inquiry highlighted the importance of the role that academics can play directly in the formulation of evidence-based policy. It can certainly be tempting to let policymakers fend for themselves in the war to obtain the most accurate, impartial scientific information; but I would certainly urge academics against this stance of splendid isolation. There exists a lot of misinformation in many policy areas (climate change being a prominent example) and, in the frantic and frenetic world of a politician, the best source of scientific advice will not necessarily come from those who shout loudest.

The success of the IPCC inquiry rested substantially on the willingness of climate scientists to give time, expertise, opinions, explanations and suggestions as evidence for the Committee to digest. In this regard, I really can't emphasise enough how important this continued support is from academics. Put simply: to produce a top-quality report, you need top-quality evidence. DEI regularly notifies its researchers of opportunities to get involved in Energy and Climate Change Committee inquiries (and other relevant Select Committees) and I would wholeheartedly encourage DEI academics to take up these chances – be it through the submission of written evidence, offering to attend an oral evidence session or simply writing to suggest what the Committee should consider examining in the future. Recent inquiries addressed issues such as deep coal mining, the feasibility of small nuclear power and the potential of shale gas in the UK – all controversial subjects that require diligent scrutiny if the correct decisions are to be made at the top.

Though my time in Parliament was short, it was certainly eye-opening in terms of recognising the potential that academics have to offer in terms of well-written, lucid evidence - and I, myself one day hope to contribute again through this medium. After all, the better informed the Committee's inquiries, the more salient its conclusions and recommendations and, ultimately, the better-guided and most beneficial the subsequent policy decisions.

Supporting innovation in local governance: Durham's Energy research partnership with Haringey

Haringey Council

Durham University and the London Borough of Haringey have recently launched a pioneering research partnership that will see them working together to drive economic growth and tackle climate change. Researchers at Durham will work together with Haringey to assess what the barriers to low-carbon economic development are, and to understand how they can develop low-carbon enterprise activity within the area. Applying leading-edge research to some of the most pressing practical policy issues faced by local authorities.

Haringey was the first major local authority in England to commit to reduce local CO2 emissions by 40 per cent by 2020 whilst also tackling inequality and raising prosperity. It created a Carbon Commission to help realise these ambitions. Among other things, the Commission's report recommended working with the research community to explore issues in greater depth. Haringey approached DEI due to its recognised expertise in tackling the societal aspects of energy technology and the low-carbon transition through interdisciplinary work. Its 'Science and Society' approach enables new methods and perspectives to be applied to existing and emerging energy challenges. Developing an understanding of how a low-carbon transition may have relevance for the everyday lives of people and communities is central to this.

Three thematic areas for initiating collaboration were identified: retrofit challenges and opportunities, new approaches for smart cities, and addressing the links between energy vulnerability, well-being and inclusion. Durham has significant research expertise in these areas and the partnership will enable the University to harness existing research to help inform the policy decisions made in Haringey as well as developing new research to assess the development of the models being pioneered in Haringey. The work at Durham is being led by Professor Harriet Bulkeley, Professor Simon Marvin and Dr Sandra Bell.

Key themes of the partnership work include:

- exploring the potential of cooperative models for small businesses;
- local generation and storage of energy;
- balancing regeneration with reducing carbon emissions;
- involving local communities in low-carbon technology;
- highlighting research and innovation;
- improving energy efficiency in buildings;
- relating these issues to existing problems of inequality and inclusion.

The partnership is already producing results with collaboration fully underway.

A one year project has already begun to assess the development of the retrofit cooperative and household engagement in the area. Rebecca Ince will be exploring how the retrofit cooperative has developed and assessing potentials for expanding the cooperative. She will also examine the reasons for householders undertaking energy retrofit and their involvement in the cooperative as well as the potential role of other actors in the borough (e.g. community groups) in facilitating the wide-scale uptake of energy retrofit. Rebecca has both an academic background researching domestic retrofit in English cities and experience in the building services industry, both on construction sites and in the design office.

Janice Astbury has also recently been appointed by Durham as a research associate for the partnership. She will undertake a one year project on community-based initiatives to ameliorate energy vulnerability and assessing their contribution to wider social, economic and health objectives. This will form part of Haringey's wider commitment to achieving a low-carbon transition and improving health and well-being in the borough. Janice is a very experienced researcher with a sound track record in developing, evaluating and contributing to community-based initiatives in her previous work at Heriot-Watt University, Edinburgh and Manchester University.

Haringey Council have also funded two bursaries for our MSc Energy and Society. These bursaries covered the course fees for two students as well as expenses for dissertation research towards Haringey's carbon reduction and inequality goals.

Last year as a result of this initiative, Pedro Martins Coas undertook a research project with Haringey's Living under the Sun community garden project. LUOS was created in 2005 by mothers of many cultures and ages to tell their 'stories' through meet, cook and eat sessions in a corner of Tottenham. Through a partnership approach to evaluation Pedro explored the ways in which the project could positively change participant's growing, producing, purchasing, eating and cooking habits. It also explored the project's impacts on participants' employability and towards residents pursuing a sustainable, low carbon agenda.

Haringey also took part in this year's Corporate Energy Forum: The Future of Energy which was jointly hosted by DEI and Durham Business School in London in May. Lyn Garner, Haringey Council's Director for Place and Sustainability showcased their pioneering approach to jointly tackling climate change and inequality through initiatives to develop low carbon enterprise activity. The forum also showcased Durham University's wide-ranging energy research and the support it provides to organisations to understand and manage issues surrounding transitions to low-carbon futures. The Forum was a great success, attended by a wide variety of industry representatives as well as MPs, policy makers and representatives from the London Mayor's Office.

This year has seen a great start to this innovative partnership and further research and collaboration is planned over the coming years.

New publications

Building with History: exploring the relationship between heritage and energy in institutionally managed buildings

Researchers at DEI argue that buildings, including historic buildings, need to be understood in a way which does not separate the physical building and how it is used socially. This approach will help to give a better understanding of how energy is used in buildings and enable us to adapt buildings for lower energy use more effectively.

A significant element of energy use arises from the complex practical interactions between people and infrastructure. The researchers argue that better outcomes for energy and heritage would result if greater contextual consideration was given to the existing possibilities afforded by historic buildings and their users.

The DEI-funded research used methods and perspectives from a variety of disciplines including history, archaeology, anthropology and engineering to explore the various social and physical aspects of buildings. Focusing on Georgian buildings at Durham University, the researchers used historical archive documents, interviews with current inhabitants and energy audits to provide a fascinating analysis of changes in the social, economic and energy structures of Durham and how this shapes the buildings.

The case study highlights the ways in which wider energy systems and social practices influence how buildings are built, used and lived in, including how energy is used within the building. Changes to these systems then result in modifications to the buildings and how they are used. In the Durham example this is exemplified by the rise, and fall, of the coal-based energy system.

In the 16th century an acute timber shortage meant that coal became a viable solution leading to the rise of Durham coal mines and industrial revolution in the area. Durham City was the administrative, legal, and polite urban centre for the elites prospering from the regional coal economy, and these groups built or renovated town houses with profits from that economy to house the affluent elite.

This shift to a high-carbon, coal-based energy regime was a social and material transition, shown by changes in architectural structure affected by changing social practice. An example is the 'closure' of rooms from large medieval halls to rooms associated with specific tasks such as sleeping and eating. Also associated was the beginning of the distinction between warm, comfortable internal domestic space and the natural external space.

Interviews were undertaken with the range of people whom inhabit the buildings today such as University academics, students and those responsible for meeting energy reduction targets through infrastructural upgrades or changing energy use behaviours, such as Energy Champions. The interviews addressed concerns about their own general energy-use, everyday energy practices, attitudes towards energy in an historic, academic building and their perceptions of the attitudes of their colleagues. They revealed an appreciation for the sense of history and past experienced by being located in the buildings, along with concerns about the level of heat and light in the 'leaky' historical buildings which may have impacts on the health and productivity of the inhabitants of the buildings.

A standard energy audit of the buildings was also undertaken entailing an assessment of the physical properties of the building, energy consumption data and of technical infrastructure pertaining to heating, lighting and energy use within the building.

The research found that inefficiencies relating to energy use in historic buildings may derive less from their intrinsic physical and historical characteristics than from the ways in which institutional contexts produce energy infrastructures that leave little room for user adaptation.

The article concludes that rather than seeing a conflict between measures to promote energy efficiency in buildings and aims to preserve buildings as 'heritage', a more context-specific understanding of the buildings concerned and how users interact with them could result in mutually beneficial outcomes.

Adams, C. and Douglas-Jones, R. and Green, A. and Lewis, Q. and Yarrow, T. (2014) 'Building with history : exploring the relationship between heritage and energy in institutionally managed buildings.', The historic environment : policy & practice., 5 (2). pp. 167-181.

This research and article was enabled by DEI small grants funding and mentoring. It has resulted in a new AHRC funded project which will further expand on the approach. The project, 'Building on the Past: understanding contested heritage futures through a study of renovation and retrofit of historic buildings', aims to shape policy and practice through a better understanding of how perceived conflicts between historic value and energy efficiency can be managed. The project involves collaboration with Historic Scotland, Sustainable Traditional Buildings Alliance, Durham County Council and the Institute for Historic Building Conservation.

For further information contact
t.g.yarrow@durham.ac.uk

Why organic solar cells work so effectively

A paper by Dr Chris Groves and co-authors on the operation of organic solar cells (OSCs) has been selected to appear on the cover of a special issue of the journal Physical Chemistry Chemical Physics. In the paper they use Monte Carlo simulations to try and solve the mystery of why OSCs operate as well as they do. Although OSCs have a number of advantages for their manufacture, since the active materials can be printed like a newspaper, the materials also have a high dielectric constant, leading one to expect that recombination losses may be high. However, despite this materials property, photon-to-current conversion efficiencies in OSCs can approach 100%, and the reason behind this is unclear.

Dr Groves said "One of the most recent explanations as to why OSCs work as well as they do revolves around the presence of so-called hot charge-transfer states. In this paper we apply our modelling techniques to test whether such charge-transfer states are sufficient to explain quantitatively the efficiencies seen in experiment. Surprisingly we found that they were not, instead pointing to the importance of other factors, such as local variations in energy levels, for high OSC performance. This information may prove to be vital in the development of new materials for OSCs. The recognition the paper has received so far is very pleasing and testament to the rigorous work by Matthew and our co-authors."

Chris Groves, Matthew Jones and Reesha Dyer (School of Engineering and Computing Sciences) with Nigel Clarke (Sheffield). (2014). Are hot charge-transfer states the primary cause of efficient free-charge generation in polymer:fullerene organic photovoltaic devices? A kinetic Monte Carlo study

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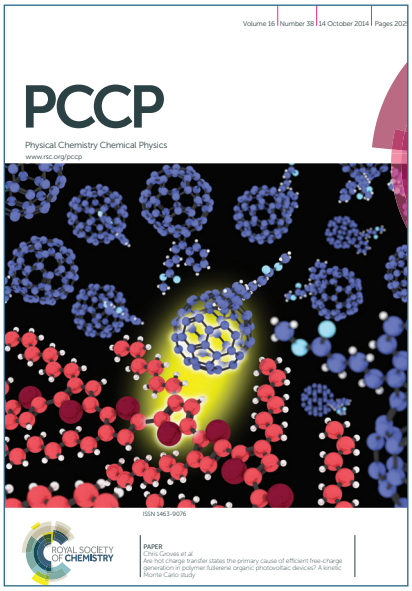

Gas can be a bridge to a low-carbon future, new research says

A major new piece of research outlines the role gas will play as a 'bridging fuel' to a low-carbon economy, but warns that it won't be long before gas becomes part of the problem rather than the solution.

Gavin Bridge, Professor of Geography at Durham University, contributed to a major new report from the UK Energy Research Centre (UKERC).

The research combines the latest energy system modelling techniques with analysis of UK gas security to assess future demand.

To prevent global temperatures rising above 2°C, the research suggests that further gas use will be needed in the short term to replace coal and complement the increases in low-carbon energy sources that must also occur.

However, this is dependent on gas use beginning to fall in the late 2020s and early 2030s, with any major role beyond 2035 requiring the widespread use of carbon capture and storage. There is also significant geographical diversity in the role that gas can play in addressing climate change; with a very limited use in some regions and an extended and strong role in others.

Changing global demand patterns and uncertainty in the long-term prospects for gas may limit the investment required in new infrastructure. This could increase uncertainty and expose countries like the UK to price volatility in international gas markets.

Professor Gavin Bridge, in the Department of Geography, at Durham University contributed to 'The UK's Global Gas Challenge' - one of two companion research reports. The report uses a 'supply chain' approach to assess the challenges to UK gas security. It takes an interdisciplinary perspective, which marries energy security insights from politics and international relations, with detailed empirical understanding from energy studies and perspectives from economic geography that emphasise the spatial distribution of actors, networks and resource flows that comprise the global gas industry.

Gavin Bridge said: "In just over a decade the UK has gone from being self-sufficient in gas to importing about half of the natural gas that it consumes – mostly from Norway. As the UK's gas import dependence has grown, it has essentially been 'globalising' its gas security, potentially increasing the exposure of UK consumers to events in global gas markets."

To date the UK has shown resilience to international supply constraints, such as the Russia-Ukraine crisis and conflict in the Middle East. Stress tests have shown that the UK can draw additional supplies from Norway and the global LNG market. However, as domestic production declines, the UK's reliance on Norwegian gas will grow. Existing Norwegian fields will begin to decline in the 2020s and the UK may have to access its gas via the continental market. This may undermine UK energy security.

The prospect of a UK shale gas revolution has been touted as a solution to our security of supply concerns. However, production over the next decade, the key time period where gas could act as a transition fuel, is unlikely to be of sufficient scale to significantly reduce UK import dependence or gas prices.

Instead of banking on shale, UKERC recommends rapidly expanding investment in alternative low-carbon energy sources and investing in more gas storage, which would help protect consumers against short-term supply disruption and price rises. Industry unwillingness to invest in additional storage is symptomatic of the high level of uncertainty surrounding future gas demand in the UK.

UK gas security is now intimately linked to developments in both the European and global gas markets and there is great uncertainty in both. What is required from Government is a policy of 'gas by design' that plans now for the changing role of gas in the UK energy mix; ensuring future UK gas security and a smooth transition to a low-carbon economy.

Bradshaw, M., Bridge, G., Bouzarovski, S., Watson, J. and Dutton, J. (2014) "The UK's Global Gas Challenge" UKERC

McGlade, C., Bradshaw, M., Anandarajah, G., Watson, J., and Ekins, P., (2014) "A Bridge to a Low-Carbon Future? Modelling the Long-Term Global Potential of Natural Gas" UKERC

Offshore renewables: a new industrial revolution?

The emergence of the offshore renewables industry has been heralded as the new industrial revolution but the pace of development continues to pose questions about the scale of the opportunity.

Government policy would appear to have had a negative effect on market confidence, to the extent that some of the larger developers, such as SSE, and original equipment manufacturers Technip and Samsung have either scaled back or torn up their offshore wind plans.

On the flip side, Siemens remains as committed to the north bank of the Humber as it ever has and the likes of Dong Energy continue to plough ahead with their development plans.

Organisations of the size of Technip and SSE withdrawing from the market is not a good sign.

It is, however, questionable whether the pace of offshore wind development predicted in the late 2000s was ever achievable given the technology, market and policy risk or the sheer availability of marinised skills in the direct face of competition from richer cousin, oil and gas. We are most likely seeing a recalibration albeit, one which needs to find its new set-point, and quickly.

There is no doubt that offshore wind will play a part in the UK's future energy mix, assuming that costs can be reduced from the current level of c. £150/MWh installed.

With cost reduction being a key factor, how can it be achieved? Firstly, through increased confidence in the fitness-for-purpose of offshore wind systems, such that investors are more assured about their likely operational performance, thus resulting in less risk being priced into the financial products underpinning the sector.

This, therefore, points to testing and certification and the hugely important role of the likes of Narec in Blyth, with its globally leading test facilities and now part of the Offshore Renewable Energy Catapult.

In addition, better performing assets lead to greater utilisation through less downtime. Maintenance and logistics have a huge role to play in ensuring that wind farms continue to operate in a safe, efficient manner and that both planned and unplanned maintenance is done in an optimal way.

Data and analysis have a huge role to play in optimising maintenance interventions and that, in itself, is a nascent sector with enormous potential and one that the UK can take a global lead in, but it will require a culture of data sharing to breakthrough.

The same applies to the construction phase of the wind farm where, unless optimised, vessel hire costs can force costs to run away from original budgets and render schemes unattractive.

The other consumer of cost is the non-standardisation of components which is currently prevalent in the sector. Once greater scale is achieved, standardisation will increase as supply chains form and mature. As a result, the industry will see a reduction in costs; however this remains a somewhat chicken and egg situation.

So, as one can see, cost reduction is a fairly transparent issue which requires a concerted effort to address.

One thing is sure, however, and that is until financiers and insurers start to get a warm feeling about the risk profile of offshore wind, the pace of development will continue to be significantly less than those predictions of the late 2000s.

Will there be a UK offshore wind industry of significance in years to come? Yes, but the timeline to it being achieved is a complex function of achieving consistent policy signals from central government, fit-for-purpose technology, maturing supply chains, appropriately skilled labour, more streamlined consenting, a culture of data sharing and rolling this all together to generate the positivity the City of London so craves.

Article by Alan Lowdon, DEI visiting professor and Advisory Board member, for the Journal Business Supplement September 2014

Energy Training @ Durham Energy Institute

DEI Masterclasses: Energy Society and Practices

16-20 February 2015

A unique opportunity to access training directly from experts across Durham University and the Energy Sector.

This four and a half day course brings together leading experts to discuss how to understand energy in society through a focus on energy practices. From material culture studies to practice theory, from economics to visual studies, we explore the analyses available in the social science and humanities that will be needed to make sense of energy and to change the way we organise energy practices.

With presentations from leading experts at Durham University, this will effectively be a series of masterclasses in understanding energy practices in a social context. Each theme is introduced through theoretical discussion and case study examples. A site visit may also be included.

Contents include:

- Key social science theories and methods, such as the idea of material cultures, everyday practices, organizational forms and social relations;
- Economics and finance in the energy sector, from the perspectives of economic theory and anthropology of economics;
- Energy policy, and how to understand governance;
- Understanding the grid – technical and commercial issues; and
- Historical and visual approaches to energy questions.

For further information and to book your place on this course go to **www.dur.ac.uk/dei/events/practices**

DEI also holds a masterclass in Energy contexts and challenges every November.

"I encourage all of my team to attend this Masters' Short Courses as it provides a wonderful opportunity for them to question the experts on the societal and technical challenges that my staff face every day."

Maggie Bosanquet, Sustainability and Climate Change team leader, Durham County Council

MSc Energy and Society

This Masters programme draws on specialist research from the interdisciplinary Durham Energy Institute to give you a better understanding of the global energy challenge. Modules are taught by world-leading researchers in Energy, Anthropology, Engineering, Geography, Humanities, Politics, Law and Business at Durham University.

Working across disciplinary boundaries, you will learn to communicate with all kinds of energy specialists, and address the questions that matter. The Masters has been developed following demand from industry, government, community and NGO partners and will provide you with unique skills to understand, analyse and deliver advanced technical and social solutions.

Combining insights from social and technological sciences this MSc addresses how we can work together for energy change.

"The MSc is one of a kind in the UK. It is focused around debating energy issues through different disciplines, which truly reflect the interdisciplinary nature of energy studies."

"The combination of the industry and technical side of energy with policy, and then society and culture too, made this a really valuable year"
MSc Energy and Society students, 2013 cohort

Now taking applications for September 2015. Find out more at **www.dur.ac.uk/mscenergyandsociety**

MSc New and Renewable Energy

New and renewable energy is the means by which the challenges of environmental and energy sustainability will be met worldwide. The MSc in New and Renewable Energy from Durham will equip you with the skills required to meet these challenges.

The MSc in New and Renewable Energy is targeted towards graduates from science or engineering degrees wanting to apply their knowledge in an energy context.

The School is one of a small number of general engineering departments in the UK. We consider the discipline as an integrated subject rather than subdividing the discipline into narrow areas. Our courses produce modern engineers who are capable of solving problems across the traditional engineering boundaries, providing an ideal environment for engineers working in new and renewable energy.

"The lectures are of very high quality, and given by experts in each subject that are more than willing to help at all times… I have been able to use new software, solve real-life problems in the field of renewable energy generation and integration, as well as developing projects in the same way an engineer would."
Sebastian Sanchez Perez-Moreno, 2014

Modules include:

- Renewable Energy and Environment
- Low-carbon and thermal technologies
- Turbomachinery and nuclear power engineering
- Energy delivery and network integration
- Energy generation and conversion technologies
- Energy, markets and risk.

Find out more about the course at **www.dur.ac.uk/ecs/postgraduate/msc/nre**

In conversation with Professor Geoff Williams, DEI visiting professor and grant capture consultant.

1. What was your first memory?

When I was very young living on a council estate in Newton Aycliffe in the mid 60s. I remember discussing with my friends how the moon got there. I argued the moon had been put there by the council as they put everything else where we saw it. Perhaps that is when I started questioning council services!

2. What did you want to be as a child?

When man landed on the moon in 1969 I was inspired to be an astronaut or a cosmonaut. I went on to study applied physics.

3. What or who has been your biggest influence to date?

My Physics, Physical Geography and Geology teachers really inspired me and these are passions that remain with me today. I have always been interested in so many issues and subject areas – glaciation, volcanology, geology, physics, meteorology, energy. This has helped me to always see connections between issues and identify opportunities.

4. If you had £1 million to spend on research what would you do with it?

If I had £1 million to spend on anything I would invest in a self-sufficient smallholding in rural Scotland. This would also develop my wife's business in eco-floristry. In research I would probably fund six different projects, identifying academic ideas at the applied stage and taking them through to concept stage. Seeing what is genuinely exploitable in the fields of integrated low-carbon technologies, medicaltechnology, printed sensors and lighting, novel charge storage etc. In the UK we do fund technically risky sectors taking risk out of very early stage technology, such as the support provided by the Technology Strategy Board. However we are less good than other countries at driving it forward to job creation. We end up losing out on competitiveness.

5. What are the real myths around energy and climate change?

The biggest misinformation with regard to energy production is that people do not realise the increasing complexity of our reliance on various foreign fossil fuel resources, and the implications for energy security and costs of extraction. People don't know how energy is generated or distributed – we have removed ourselves from the source of utilities so we have lost touch with them so much that we don't care anymore. We want electricity but we don't want it generated in our backyard. If everyone was given an energy budget and they had to manage it on a daily basis our behaviour would dramatically change. Privatisation of energy meant that private companies had interests in increasing energy consumption rather than reducing. We need to reconnect people to localised generation schemes. Perhaps we should have a zero energy day where energy is not supplied to anyone apart from the emergency services to see how we would survive like other countries in the world who live without generated power.

6. What advice would you give to our energy researchers?

Always ask the question "why should anybody be interested in what I am doing beyond academia?". You can have the best technology in the world but if no one needs it or knows about it will not be used. It is important to understand the needs of those people you are trying to engage with further afield than just academia. Have free-thinking and admit that sometimes you reach a cul-de-sac and that you will just have to change course.

7. What are you hoping to achieve through your involvement with DEI?

It's more about how I can help Durham – how can I support the excellent work being undertaken at Durham to increase industrial collaboration opportunities and funding channels. DEI incorporates all aspects of energy research – social, scientific and technological. Understanding the human aspects and how they interact with technology is key for driving innovation forward and ensuring change for the better. I think that is a strong aspect of DEI which isn't clearly evident elsewhere. The importance of involving social scientists in innovation projects is recognised by European funders but less so by Innovate UK – we need to change this!

Events @ DEI 2014-2015

Find out details of all our upcoming events and reviews of our past events at www.dur.ac.uk/events

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****Bookings can be made for specific days or the whole week****

Timothy Mitchel – Carbon Democracy and the Corporate Future 14 February
Invited lecture jointly hosted by DEI, SGIA, Geography and Anthropology. Timothy Mitchell is author of acclaimed book 'Carbon Democracy: Political Power in the Age of Oil'.

Focusing energy on Parliament 20 February
In collaboration with Parliamentary Outreach, DEI is holding this workshop for academics and regional professionals with an interest in energy policy. Learn how to get your energy work to the attention of MPs and Members of the House of Lords, in order to influence public policy in the UK.

Risk and evidence based policy making in the EU 16 February
DEI Invited Lecture by Ragnar E. Löfstedt, Director, King's College London Centre for Risk Management.

The use of nanomaterials for energy production
Invited lecture by Andrew Barron – the Charles W. Duncan, Jr. - Welch Chair of Chemistry and Professor of Materials Science at Rice University. Event jointly hosted by DEI and Chemistry Department.

DEI-DONG Energy Public debate – Wind Energy
The second debate in the series will be in Manchester. Further details to follow.

North East England: Inspiring Energetic Region Sept/Oct 2016
A showcasing event organised by Geoff Williams to be held in the EU Parliament, Brussels. The event aims to raise the profile, and to demonstrate, the region's energy capabilities for the complete energy supply chain. It will bring all our region's energy sectors together, from excellent academic research to community groups and industries, to attract new partnering opportunities and multinational investment or re-location.

DEI Seminar series
- Tripta Thakur (National Institute of Technology, MANIT Bhopal, India) - More Power to India, More opportunities for Business
- Henrik Madsen (Danish Technical University) - on Energy Systems Integration
- Prof Gavin Bridge (Geography) - Globalising UK Energy Security? Emergent Geographies of Liquefied Natural Gas
- Prof Janet Stewart (Modern Languages) – Making the case for an Energy Humanities
- Maureen Dillon – Historic Lighting
- Wendy Parker (Philosophy) – Climate modelling for policy
- Duncan Connors (Business School) – History of Nuclear Energy.