

# DURHAM ENERGY INSTITUTE REVIEW

ISSUE 9: AUTUMN 2017

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NEW DIRECTOR OF DEI**

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[www.durham.ac.uk/dei](http://www.durham.ac.uk/dei)



# // A MESSAGE FROM...

## NEW EXECUTIVE DIRECTOR PROFESSOR JON GLUYAS

Back in October 2008 I shared a cold caravan on the Dorset coast with Richard Davies. We were both leading a field trip for new PhD students who had joined the Durham University Centre for Earth Energy Systems (CeREES). Richard was CeREES director and I was employed in the petroleum industry. As we tried to warm our hands around mugs of hot tea he explained his idea about the formation of an energy institute at Durham University. He had backing from the then PVC Research James Stirling. Richard, as ever had enthusiasm to spare and he explained to me how he saw the sciences, engineering, social sciences and possibly humanities working together to develop a world-class research institute. He asked me to serve on the development board. I agreed. He also asked if I might be interested to lead such an institute. I gave him an evasive reply. It sounded exciting but I had a career in industry and a family home in Surrey. Little did I know then that I would leave industry and join Durham University one year later. I did not join to lead the Energy Institute for it was yet to form but I did become the first ever Professor of Geoenergy and Carbon Capture and Storage in the UK. Fast forward to this year and on April 1st I succeeded outgoing DEI Director Simon Hogg to lead one of Durham's most successful Research Institutes, DEI. It's funny how these things turn out!

So, how does one take a high performing team such as the DEI and make it better still? That is both a tough question and an onerous task. DEI has had two exceptional directors in Richard Davies and Simon Hogg. Sequentially they have with the executive, the fellows, the advisory board and all the contributors and supporters delivered what we have today; an internationally recognised and respected research organisation. There are maybe two things I can help add into this mix. Both will run simultaneously.

We need to increase the impact from the great work done in DEI. The institute can become the 'go to' organisation for governments, developers, news organisations and more when it comes to energy matters. But more than talk we also need action. The Durham University estate and Durham City need to become exemplars for DEI delivery of a low-carbon, sustainable, secure and affordable energy future for first the region and then the country. National energy policy built on and after the example of Durham is what I hope will be the legacy of my time in office. Work has already begun. Jacki Bell from DEI is leading our effort, working closely with Estates & Buildings and others to deliver.

Enough about the future, let us now examine the present. Late in August DEI submitted a document to the UK's House of Lords after their call for evidence around the impact of Brexit on UK energy security. DEI was able to respond quickly to this call, and took the opportunity to feed-in insights of energy academics from across the university and regional stakeholders in policy, business and the NGO sector which we had gathered over a series of DEI workshops and consultations since the referendum. I am delighted to report that Evelyn Tehrani's initiative has paid off handsomely. We could not have been better prepared. This is an exemplar of how I see DEI as perfectly positioned as a hub for all sections of the energy sector to engage on issues that matter to us all.

Thanks to the efforts of Lynn Gibson we have also been strengthening our local outreach activities with schools, the Durham Miners Association, and Spennymoor town to name but a few.

Outgoing DEI Director, Simon Hogg has been especially busy too. If being Engineering Head of Department were not enough he has already delivered an exciting new energy research programme award: Prosperity Partnerships will continue our long engagement with DONG

Energy and strengthens ties with other leaders in the wind sector – Siemens Gamesa and Greenport Hull – reinforcing Durham's position at the forefront of UK wind energy research.

While as DEI Director I can pontificate and offer fine words, it is not I who will ultimately deliver the future but the research students and early career researchers whose research and initiatives will be unencumbered by the past. To that end we are launching a fund raising initiative that will enable us to train the next generation of energy sector researchers, industrialists and social leaders and give them the tools to generate the innovations and solutions we require. The Brexit energy debate mentioned on the opposite page may well also give us a glimpse of our future. The well informed debate and discussion, developed and engineered by DEI is surely a model for future engagement with experts from industry, parliament and government?

**So, please join me in creating our future.**

// Find out how you can support DEIs  
work at [www.durham.ac.uk/dei/  
campaign/](http://www.durham.ac.uk/dei/campaign/)

# DEI EXPLORES THE IMPLICATIONS OF BREXIT FOR UK ENERGY SECURITY

## // Impact of Brexit on the UK energy system – A statement from Durham Energy Institute



DEI is making an urgent case for the UK Government to focus on energy priorities as part of the Brexit negotiations and long term industrial strategy decision-making process. The UK is already facing significant threats to the future security of the UK energy system which are likely to worsen as we leave the European Union.

In January, the DEI released a short briefing paper which sets out the key energy policy issues which policymakers will need to address during the Brexit process. This was based on inputs from energy experts in various academic departments at Durham University.

This was followed by work undertaken in collaboration with the think tank IPPR to explore views on Brexit from key energy stakeholders across the region and how these issues affect the North East in particular. An online survey was conducted and roundtable discussion held with key industry and policy stakeholders to gather expert opinion.

This culminated in a response to the EU Energy and Environment sub-committee inquiry on Brexit: energy security, one of 29 published submissions from organisations across the UK [www.parliament.uk/business/committees/committees-a-z/lords-select/eu-energy-environment-subcommittee/inquiries/parliament-2017/brexit-energy-security/brexit-energy-security-publications](http://www.parliament.uk/business/committees/committees-a-z/lords-select/eu-energy-environment-subcommittee/inquiries/parliament-2017/brexit-energy-security/brexit-energy-security-publications)

All the insights generated through this work have also helped inform the work of the Northern Energy Task Force and its first report 'Who will power the powerhouse?' which was launched in Westminster in April with newly appointed DEI Director Professor Jon Gluyas as one of the keynote speakers.



## // DURHAM ENERGY INSTITUTE AND ITS PARTNERS ARE CALLING FOR:

- 1. A consistent, long-term energy policy. It must be developed on an open and informed debate about whether the UK should aim to develop a more independent UK energy sector;**
- 2. Increased investment in research and development for storage of heat or the storage of electricity;**
- 3. Increased emphasis on exploiting indigenous low-carbon energy sources, particularly geothermal, solar and waste heat, wind, marine and solar photovoltaics;**
- 4. Incorporation of ambitious energy efficiency and energy demand reduction directives in to UK policy framework and research/development funding to support social interventions and technologies to improve efficiency and better energy use patterns**
- 5. A reset and push towards smart-grid development plans for both power and heat; and**
- 6. Measures to safeguard collaborative developments in energy research.**

## // IN RESPONSE TO THE SPECIFIC QUESTIONS POSED BY THE EU ENERGY AND ENVIRONMENT SUB-COMMITTEE INQUIRY ON BREXIT THE DEI RESPONDED THAT:

- The UK has a current energy supply challenge that is likely to be exacerbated on withdrawal from the EU. A consistent, long-term energy policy must be developed based on an open debate about whether the UK should aim to develop a more independent UK energy sector.
- The UK should make all efforts to remain in the Internal Energy Market post-Brexit.
- The UK has benefitted disproportionately from European research funding. Replacement funds will not provide the leverage we have had from the EU and until such time as new funds are formally announced and written into law there is a very serious threat that UK government promises will not be met.
- The relationship between Euratom and the United Kingdom is a strong one from which the British nuclear sector benefits, particular after local reactor design and construction expertise was lost many decades ago. Consequently, if the United Kingdom withdraws from Euratom as part of the Brexit process without comparable institutional arrangements put in place then it will no longer be at the vanguard of nuclear technical developments and will instead become a client to overseas providers of expertise and technology.



# FORTHCOMING EVENTS @ DEI

## // DEI ANNUAL RESEARCH SYMPOSIUM FRIDAY 29 SEPTEMBER 2017

*The theme of this year's symposium is "Energy Systems Integration – What do we know and what do we need to do now?"*



The energy industry is facing countless new challenges as current resources run out and new sources are developed. Our sources of generation are changing and our transmission systems are now being asked to work in a very different way to their initial design. Tackling these global challenges requires collaboration and innovation in both behaviour and technology. Lead by recently appointed DEI Director Professor Jon Gluyas, this Symposium aims to provide an insight into 4 of the major challenges of integrating our energy systems.

Panel debate sessions will include panels on **Energy and Ethics; Energy Storage; Technologies and methodologies for Energy Systems Integration; and UK Energy Market**. There will also be a photography competition and a 3 Minute Thesis Competition where you will get to hear about the **latest student energy research at Durham**. There will also be a Keynote speech by Dr Robert McGrath, Director – Renewable & Sustainable Energy Institute (RASEI), University of Colorado – Boulder.

## // POWERING THE PLANET: WHY THE WORLD NEEDS ANTHROPOLOGISTS 28 TO 29 OCTOBER



- **DONG Energy's Benj Sykes** (the leading offshore wind developer in the world),
- **EDF Energy's Sophie Bouly de Lesdain** (a global leader in low-carbon energy, covering every sector of expertise, from generation to trading and transmission grids),

- **Dr Tanja Winther from University of Oslo** (Power Engineer and Social Anthropologist who researches the social dimensions of energy), and
- **Professor Veronica Strang from Durham University** (an environmental anthropologist researching societies' engagements with water).

// Register for this free event at  
[www.applied-anthropology.com](http://www.applied-anthropology.com)

During the day, organisations from the energy industry and non-for-profit sector will present at the Energy Hotspots. There are also a range of interactive learning workshops available on Sunday 29 October.

**Do not miss the opportunity to mingle with enthusiasts from all sorts of different energy domains:**

- get advice on careers in the energy industry;

- find out how to use social science approaches in your energy company to improve your organisational structures, services or products;
- find out how technology and innovation is used to end poverty and provide a sustainable future for everyone;
- how can participatory methods be used to co-design a set of community innovation initiatives for applying renewable energy technologies at the local scale;
- learn about Durham County's mining history and how it impacts on life in the region today;
- learn about new anthropological approaches to energy questions and dilemmas.

// **Everyone is welcome to this FREE event: Social Scientists, Scientists, Engineers, Students, Businesses, Community Groups and Energy Sector Professionals.**



## // CELEBRATE SCIENCE 24 TO 26 OF OCTOBER 2017

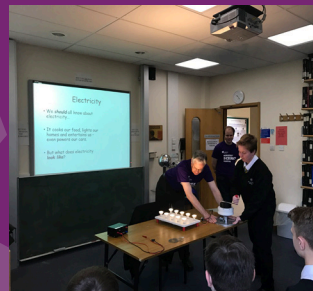
Celebrate Science is a three-day Durham University Science Festival that takes place every year during the local schools' October half-term holiday. It includes a wide range of fun and fascinating science-themed events, experiments and activities focused around a marquee situated on Palace Green, as well as at various University locations around the city.

***"BRILLIANT SCIENCE FOR KIDS. GREAT TO SEE SO MANY KIDS EXCITED ABOUT SCIENCE! KEEP IT UP!"***

Celebrate Science offers a unique opportunity for Durham University to promote its science, both teaching and research, to a general audience through engaging outreach activities. The aim is to stimulate interest in science and to inspire young people to study science in the future, while putting the University at the heart of a fun community event.

***"WHO KNEW SCIENCE WAS SO MUCH FUN?! THOROUGHLY ENJOYED EVERY EXHIBIT. CAN'T WAIT TO COME AGAIN."***

DEI will be hosting one of the stands focused on energy and electricity generation. Come along and try-out our range of interactive tools including the wind tunnel, magnets, energy generators, solar panels and a thermal electricity generator.



## // ENERGY FOR PEOPLE: IDENTIFYING INTERDISCIPLINARY RESEARCH GAPS TO ENSURE GLOBAL ENERGY SECURITY 16 AND 17 NOVEMBER

A high-level summit to set future research agendas on meeting the parallel energy challenges in the UK and in Developing countries. The event complements Durham's biennial Lumière festival ([www.lumiere-festival.com/durham-2017](http://www.lumiere-festival.com/durham-2017)) that focuses attention on electric light. The event is supported by DEI and organised by the Department of Engineering at Durham University in collaboration with Scientists and social scientists from across the university.

Professor Jon Gluyas, Executive Director of DEI will chair the summit, which will commence with an afternoon of facilitated discussions. We will be joined by academics from the N8 partnership, industrialists and policy-makers to identify the most important interdisciplinary research gaps in energy and opportunities for interdisciplinary solutions for 'global energy'.

## // DEI SEMINARS AND PUBLIC LECTURES

**Towards Sustainable Business:** DEI seminar by Dr Carol Adams, Durham University Business School // 19 October, 13.00

**Could our abandoned mines provide low-carbon cheap heat for homes?** DEI Public Lecture by Dr Charlotte Adams, Department of Geography // 25 October, 18.00

**Research Generator Lunch – Electric Vehicles and phasing out petrol vehicles:** Research Conversation to identify collaborative research opportunities // 15 November, 12.00

**How to choose mitigation measures for supply chain risks: an application in the offshore-wind industry:** DEI seminar by Dr Riccardo Mogre, Durham University Business School // 30 November, 13.00

**Optimising Infrastructure Asset Management:** DEI seminar by Dr Atai Winkler, Principal Consultant, PAM Analytics // 14 December

// To find out more about planned DEI events and to book your place go to [www.durham.ac.uk/dei/events](http://www.durham.ac.uk/dei/events)

# WIND RESEARCH AT DURHAM WITH DONG ENERGY GATHERS STRENGTH



Image Credit DONG Energy

DEI IS ENGAGED IN A RANGE OF EXCITING COLLABORATIVE INITIATIVES WITH DONG ENERGY, WHICH ARE HELPING TO MAKE THE UK THE WORLD LEADER IN OFFSHORE WIND ENERGY RESEARCH AND INSTALLED CAPACITY.

## // NEW PROSPERITY PARTNERSHIPS FUNDING SUCCESS

A collaboration, which includes Durham University, has won £7.6m funding under the EPSRC's Prosperity Partnerships call, to improve the country's offshore wind power technologies.

Led by the University of Sheffield, along with partner universities Durham and Hull and business partners Siemens Gamesa Renewable Energy and DONG Energy, the five-year programme will address current and future challenges in order to reduce the cost of electricity from offshore wind.

Engineering experts from Durham University will work on projects aimed at reducing the operation and maintenance costs of offshore wind turbines to ensure the efficient running of wind farms and on projects connected to anchoring of offshore structures. Technologies being developed at Durham will include new methods and sensors for earlier detection of emerging faults before the turbines need to go off line, better turbine blade and tower inspections techniques, improved analytical models for seabed soils and better designs for seabed anchors. All of these developments are aligned with the overarching aim of the collaborative project which is to reduce the costs of offshore wind energy generation.

### // Simon Hogg, DONG Energy Professor in Renewable Energy at Durham University, said:

*"Further reducing the cost of energy from offshore wind is critical to the long-term sustainability of the industry. This will only happen if universities continue to innovate and deliver new concepts and techniques that industry can take forward to commercial deployment. Durham has a strong track record in this area. This new EPSRC Prosperity Partnership provides us and the other university partners with the ideal opportunity to make further strong contributions in this respect, through more than twenty research projects spread across the university partners all of which link directly to the technology development roadmaps of the business partners."*



### // Benj Sykes, UK Country Manager for DONG Energy Wind Power said,

*"This is a fantastic outcome for the future of the offshore wind industry. Since our partnership with Durham University began in 2011, we have provided funding of more than £2 million to support research to accelerate the advancement of offshore wind technology, which will ultimately help to lower costs. This further funding from the EPSRC demonstrates the Government's support for this technology, and shows that industry, academia and Government are continuing to collaborate to maintain the UK's status as the global leader in offshore wind."*

*The cost of offshore wind has come down so rapidly in the past few years, that in 2016 the industry beat the 2020 target it and the Government set in 2012, four years early. As we build more offshore windfarms in the UK, we are investing heavily in operations and maintenance activities so understanding if these costs can be reduced by "condition monitoring" is key in our aim to reduce costs further.*

*As we continue to work closely with Durham University, and also in partnership with Siemens Gamesa Renewable Energy, University of Sheffield and the University of Hull, we look forward to the outcome of bringing two global leaders in offshore wind together with world-class academic researchers to deliver solutions that will continue the cost reduction journey of offshore wind."*

## // PROJECT AURA LAUNCHED

Aura is a collaboration between major companies in the offshore wind industry, leading academic institutions and government and non-governmental organisations. It aims to act as a catalyst for collaboration and innovation to support the sector's growth. The Aura partners' vision is to create a world leading offshore wind research, talent and innovation hub supporting the developing offshore wind sector towards sustainability, establishing it as a vibrant industry in the Humber – the UK's Energy Estuary, for the benefit of the region and the country.

Project Aura is a collaboration led by the University of Hull, including the Universities of Durham and Sheffield, Siemens Gamesa, DONG Energy and the ORE Catapult. Combining academic expertise with practical realities experienced in industry it will build multi-disciplinary excellence, knowledge and innovation for the offshore wind industry, to ensure the UK retains its position as a world-leader in offshore wind. It will also facilitate the development of key skills and expertise in the wind energy sector, both at a local level and across the globe.

Over recent years the Humber region has seen a £310m investment by Siemens and ABP. DONG Energy is also investing heavily in constructing and developing wind farms in the Humber region, providing jobs and industrial development opportunities within the Port and





Image Credit DONG Energy

the region. Project Aura aims to complement these investments by focusing on three strategic areas of development: education, stakeholder engagement and technological innovation. The Durham Energy Institute provides research expertise to Project Aura from a range of departments and works together with the UK's Offshore Renewable Energy Catapult and the Advanced Manufacturing Research Centre (AMRC) at the University of Sheffield, which together comprises a long-term partnership focused on steering UK efforts towards achieving its global targets. It also has a long-standing partnership with DONG Energy that includes support to a Chair in Renewable Energy position at DEI, PhD research collaborations and endowing MSc scholarships for Durham University students each year since 2011.

## // 2 NEW PHDs FUNDED BY DONG ENERGY AT DURHAM

DONG Energy is continuing its long-standing relationship with Durham University by supporting two PhD research studentships through DEI.

Durham Energy Institute believes that addressing energy challenges collaboratively through strong partnerships with industry ensures exciting research initiatives with real world applications that achieve maximum impact in the energy sector.

Our work with DONG Energy and these new joint PhDs are the perfect exemplar of this approach in action. We believe the research undertaken will help to make the UK wind sector even more economically competitive and a reliable part of the UK and European energy mix moving forward.

The two PhD research programmes are a direct outcome of a secondment by Durham University Assistant Professor Dr Peter Matthews to DONG

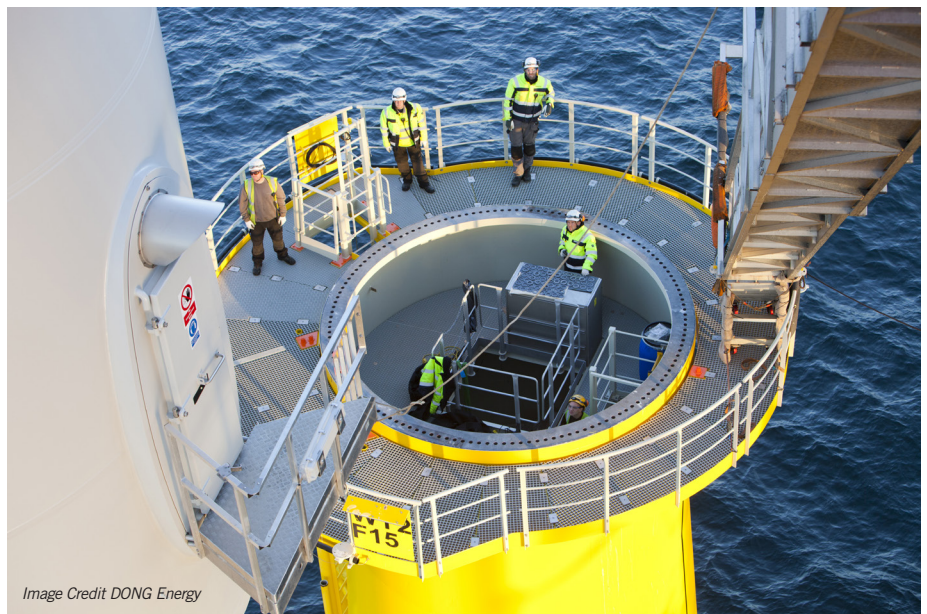


Image Credit DONG Energy

Energy in Denmark, which revealed that wind turbine maintenance logs represent a rich source of data that would support significant advances in machine learning for improving wind turbine operational efficiency and availability.

The PhDs will bring together turbine maintenance data and supervisory control and data acquisition (SCADA) data, with a view to developing algorithms for predicting turbine malfunction. One student (Roger Cox) will focus on developing a method for analysing and categorising relevant maintenance issues from the maintenance database. This will feed into the work of the second student (Luke Payne), who will focus on developing advanced data methods to positively identify turbines that are developing faults before they become critical and require the turbine to be taken off line.

This research could prove vital in improving the availability of offshore wind turbines, ultimately helping to further drive down the cost of energy.

The PhD research will be supervised by Dr Peter Matthews and Dr Christopher Crabtree from Engineering at Durham, and will be undertaken both in Durham and on site at DONG Energy's offices. By including the students as part of the DONG Energy team, they will be able to rapidly gain deep understanding of the company's key challenges and priorities. This will ensure that research remains highly relevant to DONG Energy, as well as enabling knowledge transfer between DONG Energy and Durham University.

Roger Cox is an experienced mechanical engineer who has worked on a number of renewable energy projects, while Luke Payne is a trained mathematician who has been involved with various data driven wind energy problems.

The research is expected to be completed in December 2020.



# RESEARCH UPDATE // NEW PUBLICATIONS



Image Credit DONG Energy

## // MITIGATING SUPPLY CHAIN RISKS IN THE OFFSHORE WIND INDUSTRY

Professor Sri Talluri (Michigan State University) and Dr Federico D'Amico (EDF Energy) published the article "A Decision Framework to Mitigate Supply Chain Risks: An Application in the Offshore-Wind Industry" in the academic journal IEEE Transactions on Engineering Management. The authors received support for their work by the European Union Seventh Framework Programme under the Logistic Efficiencies and Naval Architecture for Wind Installations With Novel Developments (LEANWIND) Project.

The paper is motivated by capacity improvements of recent offshore wind farm projects. These result from employing larger turbines and installing more turbines per farm, with the aim of gaining

efficiency in energy generation and also achieving economies of scale. However, larger offshore-wind farms make their construction project extremely complex to coordinate, particularly as they inevitably move into deeper waters and further from shore. In summary, the increased complexity of offshore-wind projects lead offshore-wind supply chains to face increasing exposure to risks.

With this motivation in mind, the authors aimed at designing a decision support system to mitigate the supply chain risks in the offshore-wind industry by choosing appropriate governance structures. The decision support system employs the supply chain risk management process, which calls for a holistic view of the supply chain and its risks. It improves and extends previous decision support systems by 1) proposing a method for estimating probabilities from expert judgments; 2) considering the relationships among risks and mitigation measures; and 3) modelling the selection of mitigation measures leading to the lowest supply chain risk profile.

By applying the decision support system to the offshore-wind supply chain, the authors contributed to the limited literature available on the supply chain of this expanding industry. For a supply chain characterised by medium exposure to risks, supplying a farm with capacity of 630 MW, the risk-profile-minimising governance structure is EPC (Engineering, Procurement, Construction), followed by multi-contracting and project alliance. The sensitivity analysis suggests that multi-contracting could be more effective than EPC for an offshore-wind farm characterized by low exposure to risks. Project alliance could be more effective than EPC only if the cost to set up this structure is relevantly reduced.

// Mogre, Alluri and D'Amico 'A Decision Framework to Mitigate Supply Chain Risks: An Application in the Offshore-Wind Industry' IEEE Transactions on Engineering Management, Vol 63, No 3, August 2016  
[Read the full paper on IEEEExplore](#)

## // WAVE AND TIDAL GENERATION DEVICES: RELIABILITY AND AVAILABILITY

There are many wave and tidal devices under development but as yet very few are actually in revenue earning production. However, the engineering problems are gradually being solved and there is an appetite to invest in these renewable generation technologies for harsher environments. To some extent the wave and tidal generation industry is following in the wake of the wind industry, particularly learning from the growing experience of offshore wind farm deployment. This book combines wind industry lessons with wave and tidal field knowledge to explore the main reliability and availability issues facing this growing industry.

The book provides an overview of wave and tidal development; resource; reliability theory relevant to wave and tidal devices; reliability prediction method for wave and tidal devices; practical wave and tidal



device reliability; effects of MEC device taxonomy on reliability; availability and its effect on the cost of marine energy; wave and tidal device layout and grid connection; design and testing for wave and tidal devices; operational experience and lessons learnt; monitoring and its effect on operations and maintenance; and overall conclusions.

// Peter Tavner (2017)  
**Wave and Tidal Generation Devices: Reliability and Availability**  
IET Energy Engineering Series No 18 ISBN: 978-1-84919-734-2



## // PUMPED THERMAL ELECTRICITY STORAGE FOR ACTIVE DISTRIBUTION NETWORK APPLICATIONS

An effective way of increasing the levels of electricity generation from renewable resources is integration across both transmission and distribution (in form of distributed generation resources) voltage levels within a given power system. However, their inherent intermittent behavior is potentially problematic which is why there has been a gradual shift toward a more active distribution network management schemes in recent years.



## // ENERGY EFFICIENCY AND REBOUND EFFECT IN EUROPEAN ROAD FREIGHT TRANSPORT

The depletion of fossil fuels and the environmental damage generated by its use have led to the application of policies that aim to diminish fuel consumption. These policies to promote energy efficiency enhancement as primary means for tackling the environmental and energy issues particularly in intensive sectors such as transportation. For the case of road freight transport in the European Union (where transport accounts for 25% of total energy-related GHG emissions) the objectives have been to reduce GHG emissions by 80-95% below the 1990 levels by 2050 (or 60% according to The European Commission which recognises the complexity of the transport sector). Nevertheless, the development and deployment of new and more efficient technologies is still considered the main strategy to deal with energy and environmental problems from transport.

## // ENERGY, POWER AND PROTEST ON THE URBAN GRID - GEOGRAPHIES OF THE ELECTRIC CITY

Andrés Luque-Ayala and Jon Silver, both graduates from our Centre for Doctoral Training on Energy, have published a book that examines the political dimensions of electricity grids in cities across the world. The book, titled *Energy, Power and Protest on the Urban Grid - Geographies of the Electric City* (Routledge), emerged out of the many discussions that John, Andrés and others had whilst at the CDT. Providing a global overview of experiments around the transformation of cities' electricity networks and the social struggles associated with this change, the book explores

This paper introduces a new model for Pumped Thermal Electricity Storage (PTES) devices as an emerging thermal storage technology. PTES devices are capable of reaching higher capacities than battery storage devices and therefore are suitable for grid-scale storage at the distribution voltage levels. The new model captures the inherent thermal characteristics, such as the variable efficiency, of the PTES device, yet it is not computationally burdensome for integration into non-linear optimisation problem formulations. It therefore makes it suitable for operational planning studies in active distribution networks. The new model uses a two-stage regression of a detailed thermodynamic model of PTES to capture the approximate behaviour. The salient feature of this reduced model is that the variable efficiency is a function of the energy content - the state of charge - of the device. The new model is tested on a medium-voltage 33-

One issue that has been frequently overlooked in the design of these policies is the existence of the so-called rebound effect. The concept describes the reaction that may occur when there is an energy efficiency enhancement. This results in a reduction in the relative cost of a specific energy service and hence may lead to an increase in the demand of that service. This response can result in an increase in energy consumption that can partially or totally offset the expected gains from the energy efficiency improvement.

This idea has frequently been debated in the academic literature, where diverse definitions and approaches have been used to identify and measure this behaviour. In the case of transport, the estimate impact of the rebound effect ranges between 10 and 30%, meaning a significant portion of the expected savings are not achieved because of this type of reaction. However, there are few empirical studies that analyse the rebound effect for road freight transport despite the potential relevance of this phenomenon for this particular sector. Ignoring rebound effects can lead to overstating the benefits of some policy measures, which in turn can facilitate making wrong decisions such as the (over)allocation of public funds to ineffective environmental and energy policies. Therefore, policy makers may need to take rebound effect into consideration for air quality, energy security, and climate change policy reasons.

This paper analyses the energy efficiency and the rebound effects for road freight transport in 15 European countries during the 1992-2012 period. We use a recently proposed methodology based on the application of a stochastic frontier analysis approach to estimate an energy demand function. This allows us to study the influence of potential determinants of the rebound effect in the sector.

the centrality of electricity infrastructures in the urban configuration of social control, segregation, integration, resource access and poverty alleviation. Through multiple accounts from a range of global cities (from Rio and Maputo to Berlin and Barcelona, amongst others), this edited collection establishes an agenda that recognises the uneven, and often historical, geographies of urban electricity networks, prompting attempts to re-wire the infrastructure configurations of cities and predicating protest and resistance from residents and social movements alike. Through a robust theoretical engagement with established work around the politics of urban infrastructures, the book frames the transformation of electricity systems in the context of power and resistance across urban life, drawing links between environmental and social forms of sustainability. **For a free download of the book's table of contents and introduction, click here: [tinyurl.com/z6nzbq](http://tinyurl.com/z6nzbq)**

bus distribution network within a dynamic optimal power flow formulation for day-ahead operational planning. The main objective has been to minimize daily cost of buying energy from the external grid. The results have been compared with the same test network without any storage devices and with storage models with fixed round-trip efficiency. In both cases the results clearly show the suitability and prowess of the new model in producing accurate operational cycles for the device and its benefits in terms of significant savings in operational costs when using large-scale PTES devices.

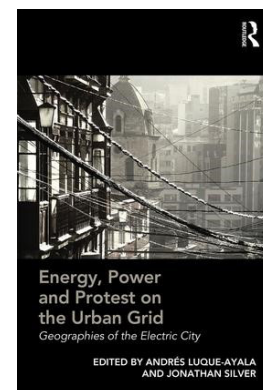
// Ibrahim, A. A., Kazemtabrizi, B., Bordin, C., Dent, C., McTigue, J. & White, A. (2017) **PowerTech, Pumped thermal electricity storage for active distribution network applications**. IEEE Manchester June 2017 DOI: 10.1109/PTC.2017.7980837

We show that the share of trucks with respect to the total number of vehicles in the sector as well as the quality of logistics in the countries have an incremental effect on the rebound effect. On the other hand, the existence of a strong railway freight transport sector reduces the rebound effect.

Our results also show on average a fuel efficiency of 88.8% and a rebound effect of 3.8% for the countries and the period analysed. Moreover, for some countries, the rebound effect reaches non-negligible values (up to 66.8%) which seems to justify the application of specific policies aimed at reducing rebound effect and not only enhancing energy efficiency. Overall, we identified large rebound effects for the countries that are more fuel efficient (e.g., Austria, Denmark or Germany) and low rebound effects for less fuel efficient countries (e.g., Hungary or Poland). However even in countries that exhibit low levels of rebound effect, the environmental impact reduction not achieved following an efficiency improvement can be significant due to the magnitude of the transport activity and the marginal cost of the externalities in those countries.

The research shows the rebound effect is a potentially relevant issue and it is therefore important to consider specific policies that ideally should be combined with adequate price signals in the sector, the promotion of intermodality and, where feasible, the provision of alternative and environmentally friendly means of transport.

// Llorca, M. & Jamasb, T. (2017). **Energy efficiency and rebound effect in European road freight transport**. Transportation Research Part A: Policy and Practice 101: 98-110.



// Luque-Ayala, A. & Silver, J. **Energy, Power and Protest on the Urban Grid - Geographies of the Electric City**. Routledge; 2016.



# RESEARCH UPDATE // NEW PROJECTS AND RESEARCH

## // NOVEL POWER SYSTEM PLANNING TECHNIQUES

The project aims to investigate investment planning over a wide range of technology options by formulating a set of decision problems. Physics-based models for different offshore transmission technologies will be coupled with statistical models to account for inherent uncertainties in both operational and environmental data which could ultimately influence initial investment and asset management decisions. The aim of the project is to find the best decisions on offshore transmission for a typical offshore wind farm which would be both economically and technically viable under severe uncertainty, given the scarce data and limited expert knowledge. The overall objective of the PhD is the development of a novel power system planning technique to support decisions on offshore transmission assets taken under severe uncertainties through probability bounding in order to deal with limited information and knowledge.

The importance of this project stems from the fact that, throughout the next decade, the power industry in the UK and elsewhere is going to be taking investment decisions on strategic assets to address the key issues described above. And this is going to happen under severe uncertainties of a technical, economic and regulatory nature. The offshore transmission industry needs to keep providing solutions that maintain the right balance between availability-affordability-sustainability, in an industry with very short operational history and new

technologies deployed in every project. The challenge for academic and industrial research power systems engineers is to design, test and validate new power system planning and asset management techniques to support the right decisions being taken under the severe uncertainties in the offshore transmission industry of the 2020's.

This project is jointly sponsored by the Faculty of Science at Durham University and by the Offshore Renewable Energy Catapult. The project is supervised by **Dr Matthias Troffaes** (Mathematical Sciences Department), **Dr Behzad Kazemtabrizi** (Engineering Department), and **Dr Ander Madariaga** (Offshore Renewable Energy Catapult).

## // PEOPLE-CENTRED DEVELOPMENT APPROACHES IN PRACTICAL AND LEARNING ENVIRONMENTS

This exciting new project, by the Europe an Union under the Erasmus+ Programme, brings together Higher Education Institutions from the social sciences with Industries from the sustainable living and energy sector to develop people-centred development approaches into their research, teaching and



learning practices. At the core of the project is the idea that understanding people should become an indispensable part of industrial development processes, as a means to achieve practical-based education as well as new categories of products, services, or business strategies that truly address people's needs and lead to sustainable innovation.

**The project has teams in four different countries across Europe consisting of an industry partner and a higher education partner:**

- **United Kingdom:** Durham University (Led by Professors Sandra Bell and Simone Abram) and company Kemuri ;
- **Slovenia:** Research Centre of the Slovenian Academy of Sciences and Arts, company Metronik and IRI UL (the coordinator);
- **The Netherlands:** VU Amsterdam and company Alliander;
- **Czech Republic:** Charles University in Prague and company VUPS.

The PEOPLE project addresses the needs of both graduates and companies: Energy industries will benefit through improved products, services and processes and developing innovation in rapidly evolving technology. Graduates will apply the skills learned through their training in sociology, psychology and anthropology to real-life and work situations enhancing their skills and employability prospects. The project will have long-lasting impact on Higher Education Institutions and society at large by improving the relevance of social science teaching and research.

This will be a great opportunity for Energy Masters students at Durham who will have the opportunity to take part in the project as part of their Field Study module for the MSc Energy and



Society course. The selected students will work in collaboration with a UK company, Kemuri Ltd to help develop user friendly elements within the company's current products and services. Student will also take part in project workshop events and exchange visits in one of the participating countries outside the UK.

The project is being kicked-off by a two-day workshop held in Newcastle in September offering practical advice and guidance on developing collaborations between Higher Education and companies or third sector organisations. The in-depth training will have a particular focus on bringing social science research into product design. It will address how we can 'train' entrepreneurs and what kind of collaboration is needed for defining R&D goals, mentoring students, locating expert knowledge, or evaluating outcomes?

**Further information about the project and activities can be found at [people-project.net](http://people-project.net)**  
**Professors Sandra Bell and Simone Abram from Durham's Anthropology department will be leading from Durham University.**

## ADVANCED INORGANIC FUNCTIONAL MATERIALS: FLOATING ZONE CRYSTAL GROWTH SYSTEM (2017 TO 2021)

The development of new inorganic functional materials, needed for a range of applications, requires the understanding of structures and physical properties of the candidate phases.

On the structural side, high-quality large (cm-sized) single crystals are the best samples on which to solve and refine structures of such materials. The reason for this is two-fold. Firstly, single crystal diffraction has the advantage over powder diffraction in that the intensities of individual Bragg reflections can be measured reliably, whereas the latter suffers from peak overlap. Secondly, neutron diffraction is the method of choice for structure determination of functional materials in which the X-ray scattering is dominated by heavier cations and key information (atomic positions, occupancies, thermal displacement parameters) about the anions cannot be determined reliably. In addition, neutron diffraction can also probe long-range magnetic order. Large single crystals are needed due to the weaker interaction of matter with neutrons relative to X-rays.

For physical property measurements, large single crystals offer several advantages compared to working with powdered samples. For example, crystals can be oriented with respect to experimental probes in order to investigate the directionality and anisotropy of physical properties such as electrical or magnetic responses. In addition, property measurements on polycrystalline powdered materials often suffer from grain boundary effects, which cannot always be separated from the response of the bulk of the material.

In this project we will establish a floating zone crystal growth system to produce high-quality

samples of a range of important inorganic materials. These include materials for energy applications (fuel cells, photovoltaics, thermoelectrics) and those where electronic or magnetic ordering leads directly to exploitable properties such as piezoelectricity, sensing, under-water and medical imaging, gas separation, memristor and multiferroic memory applications. The information we gain on the structures and physical properties will help the exploitations of these compounds and give us the insight needed to design new generation of improved functional materials.

**This project is funded by EPSRC. Principal investigator Dr Ivana Evans, Department of Chemistry at Durham University and DEI Fellow**

## WELCOME TO NEW COFUND JUNIOR RESEARCH FELLOW IN ENGINEERING



Dr Mujeeb U Chaudhry, joins Durham University Engineering department for two and a half years through the CONFUND fellowship scheme. While he is here he will be working on the development of organic/inorganic electronic and optoelectronic devices. He would like to meet new people across the university and outside who are interested in Low power electronics, display pixelation, Bio-medical sensors, organic lasers.

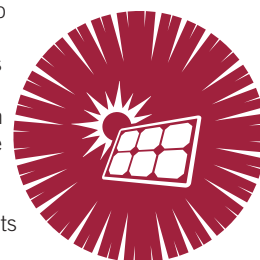
Dr Chaudhry completed his PhD degrees in Solid-State Physics at Johannes Kepler University Linz in 2011. He undertook postdoctoral research positions at the Johannes Kepler University Linz and the University of Queensland prior to joining Durham University in 2016. He is author of more than 40 journal articles, reviews, and book chapters.

His research interest is the study of physics of organic semiconductors, thin film growth of organic materials, films structural analysis and its device applications, device physics and engineering of organic field effect transistors (OFETs), organic photovoltaic (OPVs) and organic light emitting diodes (OLED), Ambipolar transport in FETs and light emitting FETs.

## NEW RESEARCH INFRASTRUCTURE IN ENGINEERING FOR ENERGY CONVERSION SYSTEM

Academics engaged in leading research within the Future Energy Systems Research Challenge, Department of Engineering, have been successful in attracting over £350,000 from the University in order to update their research and teaching infrastructure in the field of energy conversion systems. This expenditure will see significant laboratory refurbishment and equipment upgrades aimed at expanding the Department's research and teaching capability in the areas of electrical machines and drive train research, smart grids and their associated power electronic converters - this investment in Electrical Engineering builds on a long track record and an outstanding research portfolio in this field.

As well as significantly expanding the research capability and increasing the volume and scope of potential PhD projects, the refurbishment will help expand interactions with industrial collaborators and attract new industrial links through new research projects and engineering consultancy. This research infrastructure upgrade comes as the number of academic staff within the field of Electrical Engineering is due to increase, with two new Academic posts to be filled by early 2018 and the MSc in New and Renewable Energy set to attract record numbers of postgraduate students to the Department.



Dr Christopher Donaghy-Spargo, the Deputy Director of the Future Energy Systems Research Challenge and DEI Early Career Fellow said;

***"This news is very much welcomed in the Department of Engineering as it is a clear indication that the technical research under the theme of Energy undertaken in the Department is valued by the University. This investment can only assist in expanding and intensifying the research & teaching operations within Electrical Engineering, a direct complement to the activities of the DEI. The refurbishment will be completed by end of Q2 2018 and the opening of the new laboratory facilities will be marked by an opening event, to be announced shortly".***

**Find out about the new Engineering Research Challenges at [www.durham.ac.uk/engineering/research](http://www.durham.ac.uk/engineering/research)**

# RE-ENERGISING THE MINING HERITAGE OF COUNTY DURHAM THROUGH GEOTHERMAL PROJECTS



An exciting new research project is being led by Dr Charlotte Adams into the potential of low carbon heating systems from abandoned mines in County Durham. County Durham has a rich mining heritage, with coal production and use a core aspect of life for several generations. Instead of thinking of coal mines as 'part of a bygone era' this project suggests that there is potential to use disused mines for geothermal energy, which can supply heating and hot water to local homes and businesses.



## // COAL FUELED GROWTH IN COUNTY DURHAM

Britain turned to face the challenges of the nineteenth century with great momentum. Popular ideals of economic growth, spurred on by a century of scientific innovation, gave rise to an age of unprecedented development and change in Britain and elsewhere.

At the heart of this revolutionary period were the coal mines of the UK, which played a key role in powering British industry, as steam engines replaced human and water powered machines.

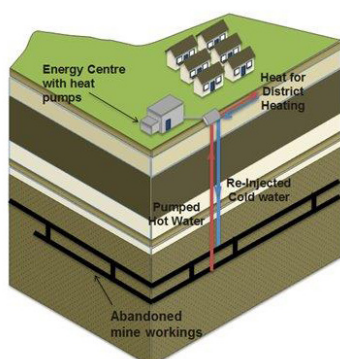
The expansion of coal mining changed the social and natural landscape of County Durham substantially. Many of the infrastructural developments in the area resulted from mining and reflected the geological distribution of coal reserves; the numbers of villages expanded dramatically to provide manpower for each working mine; and mining provided a livelihood to the majority of the population in this region.

However during the 1980s and 90s the majority of UK's mines were closed, with the last Durham mine announced for closure in 1994.

## // RE-ENERGISING COUNTY DURHAM TODAY

Changes that have taken place in County Durham as coal mining was introduced and then removed are significant. Nowadays, coal mines are commonly regarded as relics of a bygone era because of coal's overall absence in British industry and growing public concerns that it may have negative impacts on the environment.

In the wake of the pit closures the region has also experienced high levels of unemployment and resulting economic and social deprivation. Many former mining communities in the North East have experienced fuel poverty, which is estimated to be around 17.6% of average households – 37, 445 homes in total, according to recent National Energy Action (NEA) statistics.



Geothermal Minewater Schematic

*"In the 1980s and 90s, nobody worried about climate change. Coal fires and chimney smoke was part of our communities until we found out that this destroys the ozone layer. People are gradually starting to think less about heating their homes and more about climate change. Nowadays, large energy companies are very powerful. I'd be in favour of a cooperative, if this project gets investment."*



Spennymoor resident, former coal miner and Alderman, Andrew Smith (Photo Credit: Mika Laiho)

This project hopes to directly develop secure and low carbon energy supplies for Spennymoor and bring back local benefit from the local mines. Alderman Andrew Smith, who is a Spennymoor resident and former coal miner, also thinks that Dr Adams' project might be an opportunity for communities to regain some local control over energy production.

## // GEOTHERMAL ENERGY IN SPENNYMOOR

Dr Charlotte Adams (Research Manager at BritGeothermal and Assistant Professor at the Department of Geography/DEI) is leading this exciting study to look at the viability and sustainability of using ground water sources within the mines to heat public and private buildings in Spennymoor.

In July, Dr Charlotte Adams successfully secured a DEI small grant to help develop this project. This enabled an event to be held at Spennymoor Town Hall to present the innovative project to local residents and stakeholders.

The Spennymoor project hopes to implement new technology designed to heat homes at a minimum cost to the environment and the local community. The project will ascertain whether flooded abandoned mines beneath the town are suitable as a source of heat when used in conjunction with heat pumps either individually or as part of a heat network for areas of the town. The project has gathered mine plans and mapped areas of flooded abandoned mine workings, and is looking for correlation between resource and demand and

estimate the resource available.

According to Dr Adams, there is great potential for investing in mine water heat systems, not just in the UK but in other communities of the world where disused mines exist. Of course, investment is crucial, but long-term benefits include decreasing Britain's dependency on imported gas, overall carbon emissions reduction, and decreasing levels of fuel poverty in lower income regions like County Durham.

Currently most UK homes are heated by a gas boiler. In this project Dr Adams is looking to use the minewater from flooded mines beneath our towns as the energy source. Properties could be connected to a heat pump that draws water from the flooded mines where water lies at temperatures of 12-14 degrees. The water from underground will not be directly used in homes, instead it will be passed through a heat exchanger where some heat is removed before it is returned to the mines. Clearly this is too cold for taking a bath but by using a heat pump temperatures can be boosted to a more useful temperature.

A few villages in County Durham and elsewhere are beginning to realise the potential of their mining heritage. Spennymoor is very suitable for a minewater heat network because there are areas within the town planned for new housing development. The town also has the advantage of its mining museum and links with the Coal Authority archives and the wealth of information available there means the project can move forwards rapidly.

Innovative initiatives such as this can support UK government aims to lower total carbon emissions as part of a concerted European effort, under the recently signed Paris Agreement. It now appears that Westminster can look to County Durham for answers to questions related to fuel poverty, unemployment and even global warming. By re-thinking energy and society relations, coal mines can be imagined differently and perhaps, still, in terms of energy output.

If this innovative project can be successfully implemented the hope is that coal mines can have a key role for future generations in County Durham, and begin to support local livelihoods again while helping to build a low-carbon future.

**'Find out more about our Geothermal energy work, read the DEI briefing note on the UK Geothermal resource and watch Dr Charlotte Adams' ITV interview at [www.durham.ac.uk/dei/projects/heatnetwork](http://www.durham.ac.uk/dei/projects/heatnetwork)**



# MYGRIDGB – MONITORING GBs ELECTRICITY SUPPLY MIX

We hear from Dr Andrew Crossland DEI Associate Fellow, Alumni from our Energy Centre for Doctoral training and recent winner of EnergyUK's 'Rising Star' award.



In December 2015, I started a Twitter feed, MyGridGB, which published the changing electricity generation in Great Britain. I combine data from National Grid and from Sheffield University to build a real time picture of where our electricity comes from.

Since 2015, I have added the MyGridGB website and blog ([www.mygridgb.co.uk](http://www.mygridgb.co.uk)) and now also track the carbon intensity of our electricity. The project has exceeded the expectations which I had for it. I get 4,500 profile views and more than a quarter of a million impressions on Twitter each month. My new blog is growing in prominence and has been used to inform various media outlets and other energy information providers. During Brexit, the import figures on my feed provoked much interest from both sides about our ties to European electricity systems.

MyGridGB is about providing an informed forum on the breadth of issues which energy encompasses. It is about energy security, use, generation, demand time, greenhouse gas, noise pollution, visual pollution, water security, ecological damage, ecological protection. Everyone has an opinion on energy and these issues, and MyGridGB tries to put real numbers in front of people so they can make informed decisions rather than reflecting the opinions of others.

The project aligns well with the broad, interdisciplinary focus of the Durham Energy Institute, of which I am an Associate Fellow. In January 2017 I was awarded funding by the DEI to support the MyGridGB project and to expand its reach.

In 2016 there were some major electricity changes, as tracked by MyGridGB. Here is what I think were the three biggest events which caught the attention of my followers.

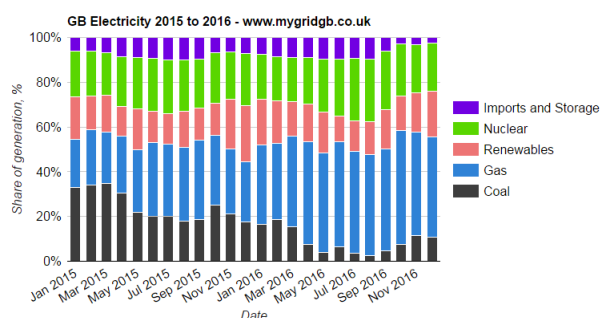
## BRITAIN DOESN'T ALWAYS CONSUME COAL

For the first time in over a century, all of Britain's coal power stations were switched off. Coal generation fell 25% over 2016 and provided less than 10% of our electricity over the year.



GB electricity: wind 6.1% coal 0.0% nuclear 20.8% gas 39.2% hydro 0.4% import 7.3% solar 18.7% biomass 6.5% storage 1.0% Demand 32GW  
1:33 PM - 14 May 2016

In this blog, I looked at what is replacing coal. Looking at the data, I found that it is not renewables which are replacing coal, but gas. With coal power stations closing, Britain has lost its ability to hedge the coal and gas markets but our electricity emitted 5% less greenhouse gas for every kWh of electricity generated in 2016 than it did in the year before.



## RECORD AMOUNTS OF RENEWABLE GENERATION WERE SEEN IN 2016

Renewable generation hit record levels in 2016. 14.9% of British electricity came from wind, solar and hydro. Biomass provided 4.7% on top of that. Overall, nearly 50% of British electricity in 2016 was low carbon.

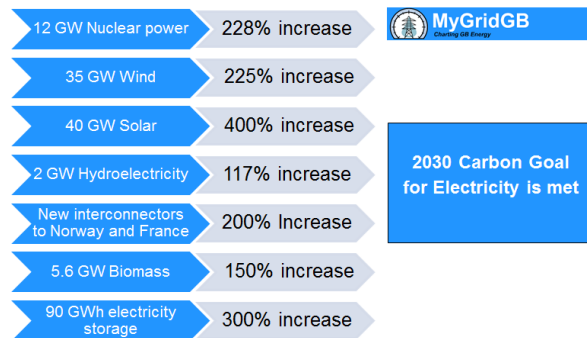
Solar hit the headlines on 5th June 2016 when it provided a record 24% of electricity between 2pm and 3pm. On Christmas Day, records were smashed when low carbon generation provided more than 70% of demand. The reasons for that were not just the effects of Storm Barbara; the usually low demand meant there was a big fall in fossil fuel use as I describe in this blog.

## BRITAIN BECAME A NET EXPORTER OF ELECTRICITY TO FRANCE

From January 2015 to October 2016, Britain rarely exported electricity to France via the interconnecting cable between the two countries. Since October 2016, Britain has been a net exporter of electricity between the two countries. Unusual things like this will happen in our electricity system and MyGridGB is meant, in part, to reveal them.

## LOOKING TO THE FUTURE

A big part of MyGridGB is also advocacy about different ways of meeting (or of course reducing) our electricity demand to meet carbon objectives. One way that this is done is through the "MyGridGB Manifesto for Low Carbon Electricity". The manifesto shows how we might meet our present electrical demand whilst reducing greenhouse gas emissions below 100gCO<sub>2</sub>/kWh.



During my PhD and whilst doing complimentary research funded by the DEI, I built models of energy storage and small power systems. I have scaled up those models and added some new features which let me simulate the whole of Great Britain with a new electricity supply mix.

You can log into my website and read the MyGridGB manifesto and also see it simulated in real time. That is pretty cool! My simulation consistently proves the hypothesis that a modest increase in low carbon generation and energy storage can allow us to achieve our carbon goals. Readers may not agree with the exact mix of power stations which I simulate. However, they should agree that meeting carbon objectives is a matter of ambition rather than a technical barrier.

Of course, if electricity demand grows through electrification of heating and transport, then efficient use of electricity will be ever more important and my manifesto will include these in the future.

## CONCLUSIONS


Solving challenges in energy requires a multidisciplinary approach. Solar does not work without something to provide power at night or 100% drop in night time consumption. Excessive use of coal or gas will cause irreversible climate change that will damage our prospects of society beyond all imagination. Engineering and social science combined can make renewable energy projects much more sustainable and fit for purpose – as our DEI research in Rwanda and resulting paper in 2015 showed.

I warmly welcome contributors to my blog and to my data. I would love to simulate factors such as tidal energy or carbon capture and storage. The reliability of Nuclear generates much interest amongst my readership. Expanding the work into electrification of heating and transport would help people understand how electricity could enter even more of our lives.

As Associate Fellow of the DEI, part of my role is to help steer the direction of the DEI and the more information goes into the MyGridGB project, the more informed myself, the DEI and the public can be on our changing electricity mix.

[www.mygridgb.co.uk](http://www.mygridgb.co.uk) @MyGridGB

Andrew F. Crossland, Oghenetajiri H. Anuta and Neal S. Wade  
**A socio-technical approach to increasing the battery lifetime of off-grid photovoltaic systems applied to a case study in Rwanda (2015)** Renewable Energy, vol. 83, issue C, pages 30-40



# A GROWING ENERGY PARTNERSHIP WITH MEXICO

## // MEXICAN AMBASSADOR OPENS DEI ENERGY PANEL DISCUSSION

Durham University hosted a visit from the new Mexican Ambassador to the UK in July. The visit served to highlight the importance of a growing partnership between Durham University and Mexico.

The Ambassador, Julian Ventura, opened 'The UK Symposium of Mexican Studies and Students', an annual gathering focused on Mexican research and students from across the UK. This year the event was entitled "Make it Happen" and was hosted by Durham University from 12 to 14 July 2017, funded by the Mexican Council of Science and Technology (CONACyT), Durham International Office, the Centre of Mexican Studies in the United Kingdom and supported by the Mexican Embassy in the United Kingdom.

The visit to Durham marked the first visit outside London for the newly appointed Mexican Ambassador – and was a great honour for Durham University's staff and students. In his opening speech the Ambassador emphasised the

privileged position of Mexican students in the U.K. and **"the need for action, for making a difference, for being a force for change, for making it happen, has never been more urgent"**

The event was impressively organised by a team of postgraduate students from Mexico. Jaime Salcido and Arely Cruz-Santiago, main organisers of the event, mentioned that "the symposium wants to show and promote the innovative ideas shaped by Mexicans in the UK. In this ever increasing connected world, we want Mexican students to be innovators, incubators of ideas, and be part of cutting edge research projects in all areas of the academy". The event featured key note speeches and breakout sessions with papers from students across the UK on a wide variety of research areas including Arts, Social Sciences and Humanities, Energy, Science and Technology.

// For further information go to [www.symposiummx.com](http://www.symposiummx.com)

This year's symposium opened with a special panel discussion focused on the **Energy Reforms in Mexico** recognising the huge transformations that Mexico is currently undergoing as part of these reforms and exploring where Mexico needs to focus next. The panel was organised with the help of Durham Energy Institute (DEI) and was introduced by the UK Ambassador for Mexico.

The Mexican Government has introduced major institutional reforms since 2013 which aim to attract private capital and technical expertise to build the Mexican energy industry, maximize oil and gas revenue, boost economic growth and increase environmental sustainability. The high profile international panel was chaired by Professor Jon Gluyas, Director of Durham Energy Institute, who has had 28 years experience working in the Oil and Gas sector. The panel consisted of Chris Sladen, President of BP Mexico; Tania Songini, Formerly Chief Financial Officer for Siemens UK and now at Thrive Renewables; Jose Padilla, from Ernest Young Latin America Business Centre (Europe).

**Professor Jon Gluyas, Director of the Durham Energy Institute, said:**

*"Delivering energy security, affordability and sustainability are key challenges for society and decisions made today will affect billions of people in the future. Mexico is at the forefront of changing the way it manages its own energy resources and its relationships across the globe as a significant primary energy producer. For Durham University to be able to host the XV Symposium of Mexican Studies and Students in the United Kingdom was an honour and I was delighted to chair the Energy Panel. The deep and thoughtful discussion from both panel and audience will I am sure play out in the years to come."*

## // DURHAM UNIVERSITY SIGNS ENERGY AGREEMENT WITH MEXICO

Durham University and the Durham Energy Institute have strengthened their ties with Mexico this year through a new energy agreement.

Durham University currently has a large cohort of post-graduate students from Mexico who are fully or partially funded through the Mexican Science and Technology Council - CONACyT. The University recently built on its general agreement with CONACyT by signing a new energy-focused agreement to deliver postgraduate training in energy



Mexican Ambassador (centre back) with student organisers and senior academics from Durham and UNAM



at Durham University through Durham Energy Institute (DEI). This initiative has already led to a number of new high-caliber PhD and MSc students from Mexico joining postgraduate programmes in Energy at Durham. DEI has provided support to the students to identify the right energy projects and supervisors for their interests and students have joined the departments of Engineering, Anthropology, Biological Sciences, Chemistry, Physics, Earth Sciences, and the Business School. All the students joining us through the scheme will become members of the wider DEI community at Durham with the opportunity to participate in our series of seminars, events and research activities.

We are looking forward to receiving even more energy postgraduates from Mexico in the new academic year.



**If you are an academic who is interested in identifying a funded postgraduate student for an energy project, please get in contact with DEI's Mexico Partnership lead Evelyn Tehrani on [evelyn.tehrani@durham.ac.uk](mailto:evelyn.tehrani@durham.ac.uk)**

**You can find out more about our links with Mexico and find out about some of our current cohort of students on our website at [www.durham.ac.uk/dei/partnerships/international/mexico](http://www.durham.ac.uk/dei/partnerships/international/mexico)**



## DURHAM UNIVERSITY ENGLISH LANGUAGE TRAINING IN SINALOA STATE, MEXICO

Durham University launched a new language training initiative in Mexico which is the first of its kind in Mexico. The new 8 week English language programme run by the English Language Centre was launched through a high profile televised event in Culiacan, Sinaloa, on Monday 19 June. The course was attended by 65 prospective postgraduate students from across Mexico who all successfully completed the course and look forward to studying in the UK in the near future.

By providing this English Language course in Mexico, Durham University is ensuring that the opportunity of postgraduate studies in the UK is made available to excellent students from more disadvantaged backgrounds who have a good standard of English but have been unable to complete their full English qualifications. The idea for the course came from Chris Macallister who led the team of teachers from Durham University.....

The event was attended by The Director of Social Commitment at Citibanamex - Andrés Albo Márquez; the Governor of the State of Sinaloa - Quirino Ordaz Coppel; The Secretary of Education and Culture - Dr. José Enrique Villa Rivera; The Mayor of Culiacan, Sinaloa - Jesus Valdez Palazuelos; The Director General of a consortium of Mexican technical universities called Tecnológico Nacional de México, or TechNM – Manuel Quintero Quintero ; and the Directors of a number of Mexican Universities.

The event was also an opportunity to thank Professor María Teresa Alonso Rasgado, Honorary Representative of CONACYT, for her key role in developing the Durham- Mexico partnership by announcing the award of her new Honorary Professorship at Durham.



Students attending Durham University's English Language course in Mexico

**Evelyn Tehrani from the Durham Energy Institute, who was representing Durham University at the event, highlighted the important role of energy research and training:**

*“Durham University and Durham Energy Institute are delighted to welcome such high calibre postgraduate students from Mexico to the University. We believe the energy research and training the students are undertaking at Durham will make a valuable contribution to the energy reforms and future ambitions of Mexico, allowing students to return to Mexico to lead energy transitions and promote development in their communities. Through this offshore English Language course we aim to widen the opportunity for students to come to the UK to undertake postgraduate research and look forward to welcoming more students at Durham”.*

**Dr Fiona O'Carroll, Deputy Director of Durham University's International Office, who leads on the Mexican partnership said:**

*“The Mexican student population in Durham is growing and making an increasing contribution to the University and the wider community. Feedback from academic staff about the quality of the students has been very positive and we are delighted to be involved in an initiative which will bring more talented students from Mexico to Durham”.*



**For more information go to [www.durham.ac.uk/dei/news/?itemno=31899](http://www.durham.ac.uk/dei/news/?itemno=31899)**



## INTERNATIONAL STUDENT ENERGY SUMMIT 2017: MEXICO

Student Energy and Durham Energy Institute sponsored a number of undergraduate and postgraduate students to attend this year's International Student Energy Summit (SES) 2017 which was held in Mérida, Mexico.

SES is a biennial summit that aims to educate, connect and inspire students interested in the global energy landscape. The summit consisted of discussion panels, subject specific breakout talks and opportunities for students from over 120 different countries to work together and network with the sponsors. The summit was incredibly rewarding and provided a platform for students to learn more about subjects as diverse as Global

Energy Markets, Energy Policy and Law, Energy and Poverty and Materials in Energy.

The theme of the summit was 'Releasing Potential', which focused on the role that young people have in accelerating the global energy transition and inspiring innovation in assisting the future of energy. A notable feature of the summit was the multidisciplinary nature of those in attendance; from engineers to geographers, business students to anthropologists - the future of energy will affect all sectors of society. Students had the opportunity to voice ideas during the interactive session "Breakout Jam", where any student could get on stage to pitch their idea.

At the start of the summit, Student Energy Durham (SED) attended a Chapters Day, during which the Durham Chapter met with other Chapters from around the world to discuss the future of the program and potential for collaboration between Chapters. SED was set up following the ex-President's, Nicholas Ogilvie, experience at SES 2015 in Bali. The society has been establishing itself over the past couple of years and has strong ties with the Durham Energy Institute.

We were all incredibly grateful for the opportunity to attend SES 2017 and the experiences we gained there. The summit has inspired us to continue working towards a sustainable energy future and appreciate the multifaceted nature of all involved in the energy transition. We would like to thank the Durham Energy Institute and Student Energy for sponsoring Durham University students to attend the conference and giving us the opportunity to learn and be inspired to partake in the global energy future.

**HANNAH CARDIFF & KITTY STACPOOLE,  
STUDENT ENERGY DURHAM CO-PRESIDENTS**

**SES 2017 was also a great opportunity to develop stronger ties with the students of UNAM University in Mexico City who were the main organisers of the event and did an amazing job. DEI is developing a partnership agreement with the Renewable Energy Institute at UNAM which we hope will lead to exciting opportunities for student exchanges and new research collaborations.**

*“Being from Mexico, I was delighted and privileged to attend this international student conference. My country was a perfect backdrop for this gathering: colourful, with lovely weather and friendly people that were our hosts during this four-day intensive programme. This was an extraordinary event with presentations led by experienced lectures and professionals from the energy sector. We also had interactive brainstorming sessions and networking events with these leaders.” Kenia Maldonado-Vega, Business School Student*



# IN CONVERSATION WITH...

## // PROFESSOR JON GLUYAS.... EXECUTIVE DIRECTOR OF DURHAM ENERGY INSTITUTE & DEAN OF KNOWLEDGE EXCHANGE DONG/ IKON CHAIR IN GEOENERGY CARBON CAPTURE AND STORAGE, DEPARTMENT OF EARTH SCIENCES

**We caught up with Jon to ask about his work, research loves and aspirations for the future.**

### **1. What are your earliest memories?**

My first memories were of sunshine, picking berries, the smell of bonfires and riding a wheelbarrow to the family allotment in Ashton-under-Lyne. Great memories.

### **2. What or who has been your biggest influence to date?**

My wife Theresa – of course; though my interest in science and in particular the Earth pre-date our meeting. I can't pin down when I began to take an interest in science, certainly I was very young but I do remember very clearly what it was like to sit in my first lectures, do my first practicals and field trips as an undergraduate. I was hooked! School had done little to excite me, university was simply fantastic.

### **3. What are the real myths around energy and climate change?**

The biggest myth around climate change is that the jury is still out and that humans may not be the agents of current climate change.

We are, and any cursory look at the geological record will reveal two things: Climate change has occurred many times in the geological past but the rate of change was but a tiny fraction of what we see today. We also know how living organisms react to climate change – many or most become extinct. Do you feel lucky?

As for energy, I feel the biggest myth is that we can go zero carbon without environmental consequences. The waste products from nuclear fission are widely recognised as a huge problem but there are similar sized problems with wind power and PV in terms of the environmental cost of using exotic and rare elements in the construction of the facilities. That is not to say we do nothing. We must cut out the fossil fuels but society needs to accept the consequences of doing so; there are downsides.

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

I would use the money for better briefing of the public as to options, cost and interconnections of energy systems. We are all responsible, not just big corporations – we all use too much energy and we are all responsible for changing this.

### **5. What is your biggest regret?**

I don't think I have any big regrets, none worth fretting about anyway.

### **6. If you didn't do this what would you be doing?**

Long before CSI became popular I was fascinated by forensics. I think it is the diversity of the science that is used. I once attended a lecture by the man who did the post-mortem on Gregor Markov, The Bulgarian journalist who was murdered in London – injected from a poisoned umbrella. Fascinating!

### **7. What would you say to undergraduates looking for a career in the energy industry?**

“Go create the Future”

### **8. What are you hoping to achieve as Director of Durham Energy Institute? Or what is your vision for the DEI?**

I hope DEI will become the go-to Institute for policy makers, researchers and members of the public to help better understand energy, energy systems and future solutions. Attracting the best brains to come and work with us.

// Jon Gluyas is a geoscientist with 28 industrial and 8 years academic experience. He is currently the Dean for Knowledge Exchange and Executive Director of Durham Energy Institute both at Durham University, UK. Jon has worked around the world both while in industry and more recently while in academia.

He began his career with BP Exploration in Aberdeen following a degree in Geology from Sheffield University and a PhD in geochemistry from Liverpool University. During Jon's time with BP he worked in both research and petroleum production with postings in the UK, China, Norway and Venezuela.

In 2001 Jon co-founded Acorn Oil and Gas. The company became the first company to redevelop a completely abandoned North Sea Field. In his new company Fairfield Energy, he continued the specialism he had established for developing forgotten and unwanted fields as well as redeveloping old fields.

On moving to academia Jon developed his interests in research in geoenergy, carbon capture and storage and the impact of fluid extraction and injection on induced seismicity and surface elevation.

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