The Heriot-Watt Scottish Energy News Researcher of the Year Awards 2015

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Dr. CAIRONG JIANG – one of the winners - celebrates her success with daughter Sophie Ma - an unexpected but most welcome additional guest at the award ceremony.

Scottish Energy News Special Report

By Dara Butterfield

Fergus Ewing, Scottish Energy Minister formally presented the winners of the 2015 Heriot Watt Scottish Energy News Researchers of the Year competition with their prizes.

The Winners:

Energy and the Marine Environment:
Dr. Tony Gutierrez, Heriot Watt University (1)

Energy and the Environment:
Mark Crouch And Jacobs (2)

Energy and Fossil Fuels:
Dr. Cairong Jiang, St. Andrew's University (3)

Energy Materials and Storage:
Dr. Jin Xuan, Heriot Watt University (4)

Energy, Infrastructure and Society:
Jennifer Roberts, Strathclyde University (5)

Energy Entrepreneurship:
David Townsend, Town Rock Energy Ltd (6)

Each winner was presented with a fine glass trophy and a cheque for £500 by the Minister at a ceremony hosted in Edinburgh by the UK Green Investment Bank.

Fergus Ewing said: "In any competition, there can only be one winner – and the winners in each of these six key categories are to be thoroughly congratulated for their 'early-career' research in these areas of the energy industry.

"You are very important to the future of Scotland's energy industries, not least because your research may be taken up to further help develop Scotland economy and energy sector – and this work – and the Heriot Watt Scottish Energy News Researchers of the Year Awards - may also help your to develop your own careers, whether in industry or in acadaemia."

The Minister also emphasised the importance of collaboration and partnership between the Scottish Government, academic research, innovation and enterprise economic development. He said:

"Heriot Watt's Energy Academy – and its Institute of Petroleum Studies – are two of the most successful examples of driving forward the energy agenda in Scotland. Indeed, with a student population of 11,000 people, 1,700 academic staff and an annual turnover of £120 million a year, Heriot Watt University is itself a powerful economic engine for Scotland.

"It is highly appropriate to note that Heriot Watt University is itself named after two early Scottish entrepreneurs - George Heriot, the 16th century financier and banker, and James Watt, the 18th century engineer and innovator whose invention of the steam engine literally helped to power the first global industrial revolution.

"Because their areas of expertise – finance and money, and engineering and innovation – are still vital ingredients in today's Scotland's energy mix."

The Minister also praised the live and current investment and development of the Atlantis Resources / MeyGen tidal turban array in the Pentland Firth off Caithness. "This is a tremendous examplar of success for Scotland's energy sector.

"Atlantis has raised the capital, got the consents, hired expert staff, ordered the tidal turbines and is presently carrying out groundworks to land the subsea cables on Caithness.

"My prediction is that Atlantis / MeyGen will be a tremendous economic fillip to Scotland, not only for its economic and industrial impact in the energy sector – but also – and I'm wearing my 'other hat' as Minister for Tourism here – as a 'must go to' world tourism destination site.

"So much so, I can almost hear the engines of the aircraft landing at John O'Groats airport at nearby Wick with planeloads of tourists coming to see the Atlantis tidal energy development.

Ewing also stressed the achievement of renewable energy in generating just under half (49.6%) of Scotland's energy last year – well on track to meet the 100% target by 2020. "Offshore wind power is another tremendous success for Scotland's energy sector," he said, while welcoming the contribution made by solar power and biomass power.

Congratulations to all our winners!

The Minister is presently taking forward dialogue between Holyrood and Westminster on financial issues which are crucial to Scotland's wind/ renewables industry – especially the 'crucial' feed-in tariff.

And he highlighted the importance of supporting development of offshore wind energy projects in the 'Energy Isles' – (Shetland, Orkney and the Western Isles). "These are the best locations in the UK to locate offshore wind farms – not the Central Belt.

"The potential benefits to the Energy Isles of sharing in community benefits from offshore wind developments offer transformational change to the Orkney, Shetland and Western Isles, which would be a particularly welcome side-benefit given that it is the driving wind which contributes to so much fuel-poverty in the Western Isles."

Professor Mercedes Maroto-Valer, Director of the Energy Academy, commented: "The Energy Academy provides a framework for world-class energy study and research - a sort of 'gateway to the industrial world' and one of the key benefits that our partnership with Scottish Energy News in the Heriot Watt 2015 Researcher of the Year Awards has been the way it has raised the profile of the Energy Academy.

"Our awards also reflect the entire academic spectrum of the work of the Energy Academy, ranging from technical and engineering, to social and political aspects of energy policy – all issues which also impact on the 'energy trilemma' (affordability and security of energy supply, as well as the low-carbon and environmental issues) - with which we constantly grapple."

After being presented with his award, for Energy Entrepreneurship, David Townsend, Town Rock Energy Ltd, said:

"I am absolutely delighted to accept the Energy Enterprise and Entrepreneurship Award. This is an especially meaningful recognition as it comes in part from a prestigious academic institution and is a recognition of both scientific and entrepreneurial achievements.

"The support for me and my company, Town Rock Energy - which is developing into Scotland's first geothermal energy company - is hugely appreciated. Geothermal energy has historically been neglected and under looked as an energy source as it is expensive to install and poorly understood by decision makers.

"Now though, due to the urgent need to reduce global carbon emissions whilst developing long term sustainable energy sources, it is time to develop and accelerate development of geothermal energy projects in Scotland and globally."

Dr. Cairong Jiang, commented: "It was my pleasure to meet you. I had a lovely afternoon. I appreciated all the work you and all the other people have done."

Mark Crouch, Senior Sustainability Professional at Jacobs, commented: "I just wanted to thank everyone who was involved in making these awards. It was a great event, and I personally felt very humbled to be recognised alongside such a strong list of winners."

The Heriot-Watt Scottish Energy News Researcher of the Year Awards for 2015

The Heriot-Watt Researcher of the Year awards were conceived as a celebration of energy and energy-related research being undertaken by early career researchers and young companies in Scotland.

The competition was launched in October 2014 by Professor Steve Chapman, the then Principal of Heriot-Watt University at an Energy Academy Showcase event held at Heriot-Watt University and attended by 120 energy industry experts who had gathered to hear about research and partnership opportunities to drive innovation in the sector. At the event Professor Chapman invited energy researchers from Scottish universities and colleges, as well as young graduates working in the Scottish energy industry to enter the inaugural Heriot-Watt University Scottish Energy News Researcher of the Year Awards 2014-2015.

Invitations for nominations (or to self-nominate) were afforded to identify individuals who had less than 10-years of experience in energy and energy-related research and who could demonstrate either an impact in the field in which they studied or could show an outstanding academic career relative to their peer group. Six categories were selected:

Energy and the Environment
We teach our students and carry out research on the core disciplines that contribute to a sustainable, resource and energy efficient society and are committed to undertaking high value, high impact research and knowledge transfer in topics of relevance to global environmental and urban challenges.

Energy Entrepreneurship
With campuses in Edinburgh, Orkney, the Scottish Borders, Dubai and Malaysia, Heriot-Watt provides over 100 different courses for post-graduate training. We teach our students about technology, society and context. By inspiring our students and researchers to challenge conventional wisdom they will become energy innovators. The University leads the Converge Challenge Business competition to find the next generation of academic entrepreneurs from within the Scottish university and HEI sector

Energy and Fossil Fuels
Heriot-Watt's expertise in traditional oil and gas exploration and more recently our work on shale oil and gas is well known but we have a growing research group studying ways of reducing man-made CO2 emissions through carbon capture and storage

Energy, Infrastructure and Society
Communities are coming together to meet the energy challenge. Communication and cooperation are facilitating development of skills in local groups. Communities are developing skills and applying them creatively alongside our academics to create better solutions. We are researching the integration of different types of renewable energy and investigating the effects of differing technologies on the electricity supply network. We are investigating how emerging technology will affect local communities, buildings and their energy use.

Energy and the Marine Environment
Major advances in marine technology and resource exploitation have forced changes in governance and allocation of sea space. Using large areas of the sea for marine energy development will have important impacts on users of the sea, coastal communities and marine governance. The Energy Academy research is assessing the socio-economic impacts of large-scale commercial wave and tidal energy operations. Understanding the effects of human activity on the marine environments is important and challenging. Our marine and coastal ecosystems are dynamic and complex. They provide a wealth of ecosystem services for society in addition to conservation and aesthetic values. The Energy Academy research is helping to describe ecological change in the context of technology, policy and social systems.

Energy Materials and Storage
The Energy Academy is working to increase the understanding of energy materials and their uses. If the world is to solve its energy and climate change issues it will need better storage materials with higher capacity and efficiency. We also have a growing research group working on the next generation of fuel cells and looking at solar PV and on-shore wind and energy storage.

These categories broadly reflect the focus of the researchers undertaking energy- or energy-related research within Heriot-Watt and are generally aligned with the opportunities and challenges for Scotland's developing renewable energy sector.

The winners were chosen by:

Professor Hamish Mair, Heriot-Watt University;

Professor John Irvine – University of St. Andrews;

Dr Liz Fellman, Research and Enterprise Services;

Dr. Edward Owens, Heriot-Watt University, and

Dr. Patrick McCarthy, the Energy Academy

Energy and the Marine Environment

The winner of the Heriot-Watt Scottish Energy News Researcher of the Year award has made a major contribution to environmental sustainability through his extensive work on the microbial response to the Deepwater Horizon disaster that occurred in the Gulf of Mexico in 2010.

Since oil and gas activities commenced in the North Sea and surrounding regions of the NE Atlantic about 50 years ago, pollution of crude oil and many of its refined petrochemical products has been a significant concern to the natural biota and economies that depend on these waters. Oil entering the water is ultimately removed by the activities of natural communities of oil degrading bacteria but little is known about these organisms and how they respond to oil spills.

Heriot-Watt's Dr Tony Gutierrez is an expert in studying the microbiology, biogeochemical processes and associated abiotic factors occurring in deep ocean basins where natural oil seeps and contamination from the Oil & Gas industry are a predominant feature. He is the UK's expert on the microbial response to the Deepwater Horizon oil spill, regarded as the worst maritime oil disaster in the history of the oil and gas industry in the United States.

His current research programme developed since taking up his appointment as Associate Professor at Heriot-Watt University, is targeted at acquiring knowledge and expertise on the resilience of natural systems in the ocean to recover from major perturbations in the ocean, such as oil spills, and to develop strategies to mitigate against future oil-related marine damage.

His ambition is to place Scotland at the forefront of knowledge and expertise in oil-response contingency, particularly for high risk and challenging environments, such as the deep sea and the Arctic, where oil exploration is expanding rapidly.

Energy and Entrepreneurship

The winner of the award for entrepreneurship is David Townsend of Town Rock Energy. Until 2013, he was still an undergraduate at the University of St. Andrew's but has since received the accolades of the 2013 Scottish Institute for Enterprise Young Innovators Challenge in the category of Renewable Energy, the Scottish Enterprise Young Edge winner, 2014 and the Entrepreneurial Spark Entrepreneur of the Year for 2015.

David established Scotland's first geothermal energy company. It applies well-established hydrocarbon exploration techniques combined with thermal modelling to high grade areas for hot water production from geothermal aquifers. He is also working to facilitate mine-water geothermal district heating schemes that will deliver very low carbon heat at an affordable rate to energy users in Scotland's central belt. David is also a core member of the Geothermal Energy Expert Working Group tasked with advising the Scottish Government on means of assisting the private sector in developing geothermal energy in Scotland.

Energy and Fossil Fuels

The winner of the Heriot-Watt Researcher of the Year awards in the category, Energy and Fossil Fuels is Dr. Cairong Jiang.

Cairong has been working in the laboratory of Professor John Irvine at the University of St Andrews for 6 years. It is hoped that direct carbon fuel cells, may become a highly efficient means of converting carbon from waste, biomass or coal to electricity producing an exhaust stream that is well-suited to CO2 sequestration and, hence could .underpin a new, clean carbon economy.

Dr Jiang has developed a practical system to convert the chemical energy of carbon from coal or biochar into electricity at high efficiency. She has looked at the potential of energy conversion from other carbon sources, for example, coal, beer carbon (industrial waste) and biomass thus demonstrating the potential of the use of coal, waste and renewable carbon sources as materials for high-performance, low-temperature fuel cells for the generation of electricity.

In 2012, her work was published in Energy and Environmental Science and has already been cited extensively. The research team has also filed a US patent application describing a direct carbon electrochemical cell and the University itself has received research grants of more than 1.5 M EU. The DCFC technology that she has been developing is widely considered to have the potential to convert coal to electricity at 80% efficiency and so could halve CO2 emissions from a given amount of coal.

Energy and the Environment

In the category of energy and the environment, we are pleased to recognise Mark Crouch, Senior Sustainability Professional and the Glasgow-based energy and carbon management consultancy company, Jacobs.

Mark works on a broad range of research and consultancy projects, including renewables, energy storage and low carbon construction. He has a particular interest in hydrogen, hydropower and sustainable transport.

Recently, he and Jacobs carried out a series of reviews of each of the 7 cities in Scotland for the Scottish Cities Alliance (SCA), a Scottish Government supported organisation seeking to support the city economies while developing an understanding of the risks and opportunities posed by climate change and a shift to the low carbon agenda. The scope of this project focussed on those economic risks and opportunities including employment opportunities, job creation and skills development for each city and it looked across Scotland to identify other specific collaborative opportunities. The measures were wide ranging and covered both climate change mitigation and adaptation approaches, along with consideration of how cities might maximise benefits gained through proactive engagement with the variety of current national economic and sustainability initiatives.

Energy Materials and Storage

The winner in this category is Dr. Jin Xuan from Heriot-Watt University.

His vision is to build international multidisciplinary networks for hybrid low carbon energy innovation and to connect the Scottish and overseas industrial sectors in order to promote renewable energy in Scotland. He also continues to conduct fundamental research in CO2 utilization and participates in the Huawei Tech fuel cell flagship project to develop fuel cell-powered mobile phones.

In 2011 he was the recipient of the Hong Kong Young Scientist Award given by the Hong Kong Institution of Science.. In the same year he received an award for outstanding post-graduate research from the University of Hong Kong and one year later received the Shanghai Pujiang Talent Award. In 2013 he was honoured by the American Chemical Society with the ENVR Certificate of Merit Award.

He has already published 1 book, 3 book chapters and over 60 papers (a number of which have been included in the list of 'Top 25 Hottest Articles' and 'Most Accessed Articles'). With a strong understanding of the process of commercialization he has 8 patents relating to fuel cell technologies, waste-water treatment and heat exchange and catalysis.

In 2014, he moved his academic career to U.K., taking his current position in Heriot-Watt University as Assistant Professor. He has already secured three research grants as Principal Investigator including one from industry to develop portable fuel cell power sources. His other grants include; one from the Global Innovation Initiative (funded by U.S. Department of States, totaling $900,000 USD) for an international low-carbon energy partnership with Yale University, Shell, Lu'an and Chinese Academy of Sciences; and another from Scottish Funding Council for the Scotland-Hong Kong Strategic Research Collaboration Program.

At the age of 30 he is now leading an independent research team at Heriot-Watt.

In addition he is Specialty Associate Editor of Frontiers in Environmental Science, Guest Editor of Micro and Nanosystems, and reviewer for a number of energy journals such as Electrochemistry Communications, Electrochimica Acta & International Journal of Hydrogen Energy.

Energy Infrastructure and Society

The winner in this category is a young scientist from the University of Strathclyde, Dr. Jennifer Roberts.

Her work addresses the key challenges facing modern energy development and the links to policy. It is in the area of risk assessment, perception and communication and concerns the adoption of new low carbon technologies. It informs how the necessary transition to an environmentally sound and low-carbon energy system can be implemented in a way that is acceptable to society.

The Heriot-Watt Energy Academy

The Energy Academy is itself an International centre of excellence and gateway for Heriot-Watt's research and training activities which aim to improve knowledge and understanding of the production, use and environmental/policy impacts of energy and associated resources in transport, buildings, industry and the wider economy.

Energy research is a core activity at Heriot-Watt University. We have a 'big picture' vision of the international agenda of climate change, sustainability and security of supply.

We believe that there isn't a simple solution to meeting the world's energy challenges and that the Earth's future well-being depends on finding appropriate answers that balance political, economic, sociological and technological priorities. The Energy Academy operates across our university to bring together researchers, engineers, mathematical modellers and economists. We believe that we can find better answers to the world's biggest energy challenges by this type of cross-disciplinary collaboration.

We match our skills to the emerging research and knowledge exchange challenges with those across academia and industry in:

- solar energy
- energy storage
- wave and tidal energy
- conventional and unconventional oil and gas
- novel energy-focused materials
- energy economics,
- energy use,
- energy policy,
- & supply chain logistics.

We believe that the challenges facing the sector include:

- improving efficiency of energy supply through demand- and supply side management
- reducing fuel poverty
- sequestering carbon
- reducing carbon intensity by developing new forms of renewable energy technology

We believe that the next 10 years are critical to ensure demonstration of new energy technologies. Therefore we've established the Energy Academy as a gateway for businesses from Scotland and beyond to the research expertise within Heriot-Watt. We already have agreements to collaborate and share learning with countries such as Japan, Colombia, Mexico, China and the USA.

The Energy Academy has a small business development team directed by Professor Maroto-Valer to bring together researchers and engineers across the University with other universities, industry and community groups in our quest for better solutions. Over £1 million has been leveraged for the University and we have assisted hundreds of Scottish micro- and Small to Medium Enterprises raise grants and find partners with whom to work.

We are continuously looking for ways for our University to contribute to overcoming the challenges of the energy trilemma of:

- Sustainability of supply
- Reduction in carbon footprint
- Affordability

We use instruments such as Innovate UK's Energy Catalyst competition, Local Energy Scotland's Local Energy Challenge Fund, Knowledge Transfer Project grants, Horizon 2020, Research Council and DECC grants and pump prime with funding from the Scottish Funding Council through Interface. The Energy Academy will use these to assist the University and SMEs to ensure Scotland and the UK has a sustainable energy infrastructure based on effective and affordable technologies.

We will partner and work with like-minded organisations and groups across Scotland such as the Energy Technology Partnership, Scottish Carbon Capture and Storage, the Scottish Hydrogen Fuel Cell Association and the Oil and Gas Innovation Centre and other Innovation Centres to continue to assist energy companies accessing expertise at Heriot-Watt and strengthen enterprise growth in the energy industries.

I would also like to put this on the record: *Scottish Energy News is a very clear, very helpful source of information for all the significant energy news in Scotland – I read it every day at 6.30 am.*

- Fergus Ewing, MSP, Minister for Energy, Enterprise and Tourism, Scottish Government

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