As Chair of the Energy Technology Partnership (ETP), and on behalf of my fellow ETP Directors, I am delighted to write this foreword to the 2015/2016 Annual Report.

This year has been a particularly dynamic one for ETP, as it builds on the core principles of Capacity Building, Relationship Building, Internationalisation, and Economic Impact. Each of our 12 member universities has specific strengths in energy-related research, but by pooling capabilities across ETP we achieve much more. In supporting SE and SDI through its inward and outward missions, it is clear that the ETP model is one which is envied across the globe.

The investment in the ETP pool has advanced and improved the Scottish research scene to reach a position consistent with leading international research performance levels. It delivers outcomes that sustain a Scottish energy research base that is internationally competitive, supplying the energy sector with the skills it needs, and creating value for the Scottish economy and society.

This period has seen the successful conclusion of the first phase of 2 of our key programmes: our flagship Industry Doctorate Programme supported 95 PhD students across all 9 energy themes, driven by strong industry engagement, and the demand for industry-ready researchers. With the help of the Scottish Government, we aim to pass our target of 100 PhDs in the coming months.

Our innovation exchange programme, the Knowledge Transfer Network (KEN), proved so successful that it was awarded Phase 2 by the Scottish Government and Scottish Enterprise in April of this year. Phase 1 supported over 350 low-carbon SMEs, completing 109 innovation projects between academia and industry, and delivering added jobs and investment, and helping meet carbon reduction targets. Phase 2 of the KEN is a 3-year programme that will continue to support Scottish SMEs in the low carbon sector along their innovation journey, with a team of 7 theme-specific BDMs and a £0.5M Industry Engagement Fund.

ETP’s success could not have been achieved without the continued support of our many partners, from the energy and power industries, Government, public sector and a variety of other organisations. I thank you all and am hugely encouraged that we are witnessing in Scotland a real convergence of our separate interests, in the pursuit of competitive advantage.

In particular, the development of our relationships with the Department of Energy has enabled ETP to align its activities with Scottish Government priorities in the energy sector: the managed energy transition to meet the trilemma; a whole system approach; and the localisation of energy. ETP has added 2 new energy themes, Energy Systems and Heat Energy, to its existing 9 themes, thereby reinforcing its commitment to helping the Scottish Government reach its targets.

You will find more detail in this Annual Report, which highlights case studies of how Scottish industry has benefited directly from ETP’s capability. We are indebted to the support of our funders and other key stakeholders and I would like to take this opportunity to thank them for the role they play in facilitating ETP to deliver significant technological and economic impact. I would also like to thank our Advisory Group, chaired by David Sigsworth, which continues to provide invaluable feedback and guidance.

Professor Sir Jim McDonald
“With refreshed Directorate, Theme Coordinator and Advisory Groups, ETP is now in a better position than ever to provide impartial advice and expertise to the Scottish Government as it develops its thinking around emerging national priorities in energy. The ETP Advisory Group, of which I am Chair, will continue to support ETP in strengthening key relationships with industry and the public sector, so that Scotland can benefit fully from the translation of excellent research into economic impact.”

Professor David Sigsworth, Chair of the ETP Advisory Group

Research Excellence

The Energy Technology Partnership is a part of the Scottish Funding Council (SFC) Research Pooling initiative that has invested over £350m in the Scottish research base in the past 6 years, with a specific focus on engineering and basic sciences underpinning the work of the ETP. The pooling investments have advanced and improved the Scottish research scene to reach a position consistent with leading international research performance levels.

ETP has unparalleled energy capability and core research strengths across the following range of energy technologies, including the addition of two new themes this year, Energy Systems and Heat Energy:

- Energy Systems
- Wind Energy
- Marine Energy
- Bio-Energy
- Power Systems & Grid Technologies
- Solar Energy
- Carbon Capture and Storage
- Oil & Gas
- Heat Energy
- Energy Utilisation in Buildings
- Energy Conversion and Storage

Coupled with research pooling, this provides an integrated energy technologies community that is providing strong leadership in the UK/ EU/global energy arenas.

The cohesion displayed by the Energy Technology Partnership is exemplary and provides a strong basis for collaboration with a wide variety of business, public sector and other partners. This has enabled ETP to build on its foundation of research excellence and increase its impact in the areas of Knowledge Exchange and Skills.
The ETP Energy Industry Doctorate programme is addressing the strategic demands of industry and government for ‘industry-ready’, post-doctoral researchers to enhance energy industry innovation and knowledge exchange (KE) effectiveness. A defining characteristic of the programme is strong industry engagement where companies are co-investors, supporting project specification and engaging with the research directly.

The programme has been running since 2010 and over 90 high quality PhD studentships are now underway or completed. 16 new projects were approved in 2014 - 2015 and 22 students have now graduated from the programme. Currently there are around 70 students still working on their projects.

Eligible projects can focus on energy technologies across a range of areas including wind, marine, solar, bio-energy, power & grids, energy conversion and storage, energy utilisation in buildings, carbon capture and storage, oil & gas and cross-cutting energy economics, policy & law.

“...The energy industry is crucial to Scotland’s future as a modern, prosperous economy and we need to harness and develop the very best talent in universities and in industry to secure that future. That’s what the Energy Technology Partnership does and that’s why SFC is investing £450,000 in the continuing success of ETP.”

Stuart Fancey, Director of Research and Innovation, Scottish Funding Council
PhD Case Studies

Renewable Heat Networks: Modelling for robust design
*University of Glasgow and Cluff Geothermal Ltd*

“As my project approaches its completion, I am pleased to say that it was a great experience for me as I had the chance to work with great academics and industrial partners on a subject that I really like. Throughout this project, I developed many skills that will be useful for my career and test also my capabilities in the unavoidable difficulties of a Ph.D.

Concerning the contribution of ETP, I would really like to thank you for funding this project and giving me the chance to carry out research which was a life-dream for me.”

Dr Sotirios A. Kyriakis - PhD Graduate

Economically Sustainable Development of Wave and Tidal Stream Energy Technologies
*University of Edinburgh and Iberdrola/Scottish Power Renewables*

“I was able to benefit significantly from the ‘light touch’ approach from both ETP and Fundacion Iberdrola, which enabled me to carry out research that was driven by what I perceived to be the industry need – not just the need of a single entity or organisation. By having a holistic overview of the sector, I feel that I have emerged from my research with a more rounded overview of innovation within the marine energy sector, without being biased towards any one technology solution or product.”

Dr Andy MacGillivary - PhD Graduate

“Many skills that will be useful for my career and test also my capabilities in the unavoidable difficulties of a Ph.D.”

Dr Michael Feliks, U.K. Operations Manager
Cluff Geothermal Ltd - Industrial Sponsor

Condition Monitoring for Tidal Turbines
*University of Glasgow and Andritz Hydro Hammerfest*

“Work throughout this project has progressed well, helped by regular contact and assistance from the industrial sponsors.”

Grant Galloway - PhD Student

Environmental resilience and adaption to land-based renewable developments
*University of Glasgow and SSE Renewables*

“My Ph.D. research was co-sponsored by SSE Renewables, ETP and EPSRC and its principal aim was to assess the environmental impact of a wind development on a peatland. During my research I was given special access to the Gordonbush Wind Farm site and the chance to interact with SSE employees throughout the construction phase. This gave me valuable insight into the workings of a commercial wind farm site and particularly the work of the ECoWs (Ecological Clerk of Works). This experience was highly applicable to my future career and it was a major benefit having a leading industry partner such as SSE involved in my Ph.D.”

Dr Ben Smith - PhD Graduate

Offshore Wind farm Maintenance and Sperasholding Optimisation
*Robert Gordon University and IICORR*

“The ETP sponsored Ph.D. at Robert Gordon University was a very well balanced program. The host university, industrial sponsor and the ETP took active interest in the program and additionally provided opportunities for professional and personal development through various short term courses, social engagements and networking events. As a result I found my Ph.D. journey both interesting and rewarding. ETP also provides funding to its scholars after the Ph.D. which one can use to develop his/her work. Such initiatives by ETP are quite supportive and useful for early career researchers. Overall, the ETP is an excellent platform for academics and industries to collaborate and work together to solve practical challenges. I now work as a Lecturer in the department of engineering at Robert Gordon University.”

Dr Yashwant Sinha - PhD Graduate
The Scottish Government continues to support the ETP, recognising its powerful status in leveraging combined expertise across Scottish academia into demand-led innovation with a focus on tangible benefits to Scotland’s energy system and economic development. We’re pleased to be directly supporting the ETP Knowledge Exchange Network and its valuable work driving innovation among Scottish SME’s with the demonstrable value that brings to our economy. The ETP represents an opportunity for academia and innovators to bring the insight gained from earlier stage thinking and R&D work to bear on energy policy. Conversely, the ETP is a conduit through which government can provide clarity on strategic policy direction to further promote compatibility between policy and research priorities.

Simon Coote, Head of Energy Industries and Innovation, Scottish Government

Over the course of more than 4 years, the Energy Technology Partnership successfully managed Phase I of the Knowledge Exchange Network (KEN), a £3.5M programme within the low carbon sector. The KEN built on established industrial and academic links to help the Scottish Government meet its goal in making the SME sector more research-intensive. Funded through the ERDF (an EU structural funds programme), Scottish Government, Scottish Enterprise, and the Scottish Funding Council, a dedicated team of 12 Business Development Managers (BDMs) directly increased knowledge exchange between Scottish SMEs and University R&D capability.

This programme engaged with 330 Scottish SMEs providing funding and support between the SMEs and academics from the 12 partner Scottish Universities. In working closely with these SMEs we identified, brokered, and managed 109 consultancy projects that our industry partners would normally have been unable to do, or would have found difficult to conduct effectively due to project risk, the unavailability of in-house expertise or the lack of funds.

With unrivalled connectivity into the Scottish energy research base, the ETP has become the partner of choice for Scottish companies in the energy sector who are looking to collaborate with academics and the broad network of world-class testing facilities available in Scotland.
Knowledge Exchange Case Studies

Ceimig Ltd

A spin out from the University of St Andrews, Ceimig manufactures fine chemicals including catalysts. One of the products that it commercialises is a Platinum based catalyst for use in PEM fuel cells. The product currently has several issues (i) the platinum catalyst is embedded on carbon and degrades in operation; (ii) the catalyst surface area can be improved for better performance and (ii) the catalyst is mobile within the electrochemical cell and can cause short circuiting in the cell.

An ETP supported project with the University of St Andrews has allowed the company to look at the catalyst and the support material. Through two analytical techniques, Ceimig has been able to develop a mechanism of producing a more stable catalyst with a good surface area.

While further work is required to address all the issues, Ceimig is in a stronger position to develop and market its new product.

Xi Engineering

Xi Engineering had previous experience working with the ETP on a separate project involving the Centre for Signal and Image Processing at Strathclyde. Its core business is to provide noise and vibration solutions to a wide range of industries with a predominant focus on the renewables sector. One issue that came to light in the last 6 months is the problem of tonal noise in a wind turbine tower. The tower is known to have several resonant frequencies corresponding with the main operating modes of the drivetrain. Thus, if any of these modes are excited by the tower it will result in the amplification of vibration and emission of problematic tonal noise. The ETP funded a consultancy project, in conjunction with Heriot-Watt, to investigate the use and viability of Xi’s Advanced Particle Damping (APD) pods to mitigate these vibrations within the frequency band of 100Hz-145Hz.

Whole Life Consultants Ltd

Whole Life Consulting (WLC Ltd) is a spin out company of the University of Dundee. It was founded in 2004, to commercialise the results of research projects and expertise developed by the Construction Management Research Unit (CMRU). WLC Ltd’s core activities are contract research and consultancy in the field of construction, including: whole life costing, risk based asset management, sustainability assessment, labour forecasting and productivity improvement.

The consultancy funding it received from ETP has led to the development of the functional specification for an Integrated Sustainability Benchmarking Tool (ISBT). WLC Ltd have received useful support from our academic partner (Glasgow Caledonian University). It benefited from access to the skills and expertise of the academic and research staff within the School of Engineering and Built Environment. The assistance it received from ETP has led to the development of the functional specification for an Integrated Sustainability Benchmarking Tool (ISBT). The support has also informed WLC Ltd of the challenges that need to be overcome in order to develop a fully commercial ISBT. The concept of ISBT will allow the user to assess sustainability performance of buildings in a simpler and holistic way and provide more cost effective ways of assessing and benchmarking the sustainability performance of buildings. It will also provide the means of efficiently analysing sustainability performance in order to find the best whole life sustainable design solution of a building.
Following on from the success of KEN Phase I, KEN Phase II is now open for business. With funding from the Scottish Government, Scottish Enterprise, ERDF, and substantial support from our partner universities, a team of 7 BDMs with specific knowledge of their low carbon theme, will have a key role in proactively contributing directly to Scottish Enterprise’s aims of accelerating 5000 Scottish SMEs along their innovation journey. Also two of the BDMs are embedded in the Offshore Renewable Energy Catapult and Wave Energy Scotland, to foster better collaboration with these organisations.

Supported by a core team of Executive Director, Project Manager, Project Assistant, & Communications Assistant, ETP will raise the awareness of different kinds of innovation and support opportunities; deliver a range of engagement activities aimed at increasing SME participation in R&D; and assist technology pull from its partner universities. And with 2 new energy themes covered, the KEN retains a good strategic fit with Scottish Government energy policy and Scottish economic development priorities.

Business Advice and Support
Through accessing its broad network of academic expertise, the ETP gives access to a range of services. Our knowledge and experience of the funding landscape means we will be able to offer end to end guidance for companies requiring support during the difficult growth stages.

Successful Partnerships
In supporting over 350 companies in Scotland and delivering over 100 projects to industry, the ETP is playing a key role in the transfer of knowledge between academia and industry, and is helping to build the overall capability of the low carbon and renewable energy sector. Now with closer links to Scottish Enterprise, ETP can help you to access the entire funding escalator, from the £5k Innovation Voucher, through SMART and R&D grants, to EU and Innovate UK calls.

Contact Us
Our Business Development Managers are available to discuss with you areas of possible collaboration and can help identify the many different ways in which the ETP can add value to your business. They will be able to give you an overview of other successful collaborations with similar companies in the low carbon and renewable energy industry sectors. Our team will be able to share with you the emergent best practice between academia and industry and help you in identifying the best possible support available.

ETP Industry Engagement Fund

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<tr>
<th>ETP Industry Engagement Fund</th>
<th>up to £20k funding available to SMEs operating or planning to operate in Scotland</th>
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<tr>
<td>1 week funding decision turnaround</td>
<td>Simple short application process</td>
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<td>70% intervention rate with 30% in-kind company contribution</td>
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“The ETP represents an unparalleled pool of expertise with around 250 academics and 700 researchers delivering world-class capability and resources in energy research, development and demonstration. The ETP’s success in linking Scotland’s academic base together and connecting it to industry has created a compelling asset for Scotland, particularly for inward investors looking to tap into this network. Scottish businesses also benefit from working with the ETP to drive up levels of business innovation by developing new technologies, products and processes, all of which help to ensure Scottish businesses stay globally competitive.”

Margaret McGinlay, Director of Energy and Low Carbon Technologies, Scottish Enterprise
Nova Innovation: world first for tidal energy

In 2016 Edinburgh-based Nova Innovation deployed the world’s first offshore tidal array in the Bluemull Sound, Shetland. This was a huge achievement for a company founded in 2010, which has grown to employ 20 people in Edinburgh and Shetland.

Nova Innovation has strong links to the academic research base in Scotland. In 2014 Nova Innovation was the first tidal energy company to make use of the FloWave wave and tidal test facility at the University of Edinburgh through support provided by the Energy Technology Partnership. FloWave is capable of repeatedly simulating sea conditions at scale to test marine renewable energy devices.

In 2016 the company completed a Knowledge Transfer Partnership (KTP) with the University of Edinburgh in which they developed a novel direct-drive generator for a tidal turbine. The KTP project received an “outstanding” award, recognising the significant benefits of the project for the KTP associate, academic and industrial partners.

Simon Forrest from Nova Innovation said, “The lessons we learned from FloWave, which was partly funded by the ETP, enabled us to accelerate the development of our tidal technology. In conjunction with our KTP project with the University of Edinburgh, this has significantly advanced the technology for our next generation tidal energy devices.”

ETP has helped Nova to build strong links with the university sector in Scotland. The company recognises the value that access to academic expertise can provide through programmes such as the ETP Consultancy Fund and the KTP scheme.
"This experience was a true example of how ETP realizes its goal of supporting collaboration and knowledge exchange between industry and academia on a global level. I am greatly thankful for receiving this international exchange grant as it offered me the opportunity to reach out to experts in building industry to discuss their challenges and advances in their own setting, including practitioners and academicians in the US and the Netherlands. Over the course of six weeks, this award gave a massive momentum to my PhD research and I am now connected to a network of experts, who inquire about my research progress and kindly offer additional advice and support regularly."

Sahar Mirzaie - ETP PhD Student, Heriot-Watt University

Internationalisation

Post Graduate and Early Career Researcher Exchanges (PECRE)

The SFC PECRE scheme provides research training and development opportunities for the most able postgraduates and early career researchers working within the Scottish research pools, while at the same time building experience of international collaboration with academia and/or industry. The fund supports researchers to participate in exchanges with companies or academic institutions in Europe, North America, China and India.

Under this scheme, ETP awarded 4 grants to existing ETP Doctorate students, to maximise their exposure to international collaboration, and increase the impact of their doctorates. The projects included exchanges with the USA, Spain, Belgium, and Denmark, on subjects ranging from solid adsorbents for CCS, to demand-side management and network simulations.

Pool’s Engagement in European Research (PEER)

The SFC PEER scheme supports pools in engaging with the EU Framework process, showcasing their skills and capabilities and participating in specific networking activities both for policy influencing and project preparation, in addition to developing proposals and applying for European funding under the Framework Programme.

ETP awarded a grant to an academic/industry consortium led by Glasgow Caledonian University, whose project will contribute to significant capital investment in energy generation and distribution infrastructure and will create a number of contract and operational employment opportunities for the economy. The consortium is planning to submit into both INTERREG and Horizon 2020 calls, with a total possible fund of over €15M, involving participants in Spain, Finland, Sweden, Holland, Germany, Belgium, Wales and Scotland.
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