

# Blue sky research for energy technology

*The role of blue sky research and innovation in addressing energy challenges*



An event organised under the auspices of the  
**Experts' Group on R&D Priority Setting and Evaluation  
(EGRD)**

**14-15 June 2017**

**Hosted by the University of Birmingham**  
Muirhead Tower, University Ring Road North, 12<sup>th</sup> floor



*Experts' Group on R&D Priority Setting and Evaluation*

## **International Energy Agency (IEA)**

The IEA is an autonomous agency established in November 1974. Its mandate is two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply and to advise member countries on sound energy policy. The IEA carries out a comprehensive programme of energy co-operation among 29 advanced economies<sup>1</sup>. The Agency aims to:

- Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.
- Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
- Improve transparency of international markets through collection and analysis of energy data.
- Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations, and other stakeholders.

Since the 1980s, the IEA has continued to build good working relationships with countries beyond its membership, in particular major energy consuming, producing and transit countries. Countries with which the IEA seeks enhanced engagement including Accession countries Chile and Mexico, Association countries China, India, Indonesia, Morocco, and Singapore. Co-operation with these and other partner countries cover a wide range of activities, from joint workshops to in-depth surveys of specific energy sectors or data exchange. Combined, the IEA co-operates with more than 69 countries worldwide.

## **IEA Energy Technology Network**

The IEA Energy Technology Network is an ever-expanding, co-operative group of more than 6,000 experts that support and encourage global technology collaboration. At the head of this vast network is the Committee on Energy Research and Technology (CERT).

### ***Committee on Energy Research and Technology***

Comprised of senior experts from IEA member governments, the Committee on Energy Research and Technology (CERT) considers effective energy technology and policies to improve energy security, encourage environmental protection and maintain economic growth. Under the guidance of the IEA Governing Board, the CERT oversees the technology forecasting, analyses and the research, development, demonstration and deployment (RDD&D) strategies of the IEA Secretariat, notably through its flagship publication, *Energy Technology Perspectives*, and the series of energy technology roadmaps. The CERT also provides guidance to its working parties and experts' groups to examine topics that address current energy technology, or technology policy, issues. The CERT is supported in its work through four topical working parties, including the EGRD.

### ***Experts' Group on R&D Priority-Setting and Evaluation (EGRD)***

The EGRD examines analytical approaches to energy technologies, policies, and R&D. The results and recommendations support the Committee on Energy Research and Technology (CERT), feed into IEA analysis, and enable a broad perspective of energy technology issues. Recent topics analysed include Life in the Fast Lane: evolving paradigms for mobility and transportation systems of the future (2016), Space Cooling (2016), Island Energy - Status and Perspectives (2015), and Will a Smarter Grid Lead to Smarter End Users - or Vice Versa (2015).

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<sup>1</sup> Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea (Republic of), Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States; The European Commission also participates in the work of the IEA.

# Blue Sky Research for Energy Technology

14-15 June 2017

*Hosted by the University of Birmingham, United Kingdom*

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Global energy markets today are dynamic and undergoing a process of transformation. Advanced technologies, many of which arise from investments in research, create new options for energy systems. Innovations can improve productivity, reduce costs, and enable solutions to pressing problems that had previously been thought to be out of reach. Witness the deep reductions in the cost of technologies, such as LED lighting, lithium ion batteries, wind and solar power; new materials with revolutionary properties that open vast new horizons for innovation; integrated design, equipment, communications and controls that dramatically improve energy efficiency in buildings and transport; and new technology for modernizing the transmission, distribution, and storage of electric power. The coming decade represents an important period in the development of an even smarter energy system.

The capacity to innovate is fast becoming the most important determinant of economic growth in the 21st century global economy.<sup>2</sup> It is also central to bringing practical solutions to vexing challenges in energy and environment. But, if innovation is the engine of productive change, what drives innovation?

Innovation is a shared consequence of inspired creativity, leadership and investment in research by both the public and private sectors. Many of the most innovative technologies shaping global energy markets today can trace their origins to public investments in “blue sky research”, that is in basic sciences, novel approaches, risky exploratory research, and early-stage technology development. While publicly supported blue sky research may be a wellspring of new knowledge and discovery, the private sector has, and must continue to, identify, evaluate, and carry forward the best ideas to commercialization. A robust innovation ecosystem depends on both, but it is fed and nourished by public investments in blue sky research.

## **Government models**

Many governments around the world have recognized this need for innovation in the energy sector and have set up various schemes to fund and support innovation – from research and development to demonstration and pilot project to market launch support and market integration of new technologies.

However, many of these programs, especially when industry is involved, focus on rather late stages of development and higher Technology Readiness Levels (TRLs), aiming at improvements of existing technologies, which have already been successfully validated in the lab, and preparation of innovative products for future markets by increasing reliability and reducing production costs.

Besides these innovation funding schemes with clear and well defined goals, governments around the world run programs in basic research, or blue sky research. Blue sky research (BSR) is basic science research where practical applications may be envisioned but are not immediately apparent.

In the long run many topics, which once were investigated in the context of basic research, turn out to be useful for the development of new innovative products. However, it is often difficult to foresee the possible impact of individual lines of research for later applications. Policy makers face the challenge of understanding possible impacts at an early stage and engaging industry, both for investment in basic research topics and to help guide this basic research to the creation of new innovative products.

In addition, governments are exploring ways to stimulate radical innovation: radical or abrupt changes that challenge and transform larger social, economic, environmental and/or governance systems. These disruptions may lead to positive change, as with a new clean technology, or negative change, such as a significant socio-economic adjustment. As radical innovation is primarily a business model challenge rather than a technology challenge, the role of industry and the private sector are paramount.

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<sup>2</sup> U.S. National Research Council, “Rising to the Challenge,” [www.nap.edu/catalog/13386/rising-to-the-challenge-us-innovation-policy-for-the-global](http://www.nap.edu/catalog/13386/rising-to-the-challenge-us-innovation-policy-for-the-global).

For governments there is also the challenge of how to stimulate organisations that can arbitrate between the innovation assets of the public and private sectors; acting to translate basic research into a form where it can create value for society. How can these intermediaries assist in the process of stimulating, informing and creating value from blue sky research.

In this workshop, the EGRD examines ways to stimulate blue sky research within the energy sector in the broadest sense of the word. Different methods will be presented and discussed. The goal is to find examples of practical results borne out of blue sky research, determine how lessons from these examples could be applied to stimulate the pace of innovation in the energy sector, and advise policy makers as to how to engage at critical points in the process.

## **Scope**

The goal of this workshop is to learn from examples of how the transition from BSR to application has been successfully undertaken in other sectors for example, space research, medicine or solid state physics in the context of microelectronics, and to identify from current basic research selected areas or ideas that might potentially have a huge impact on the energy sector. This should inform an understanding of how different governments engage in, fund, and structure their investments in energy-related basic science programs.

The EGRD workshop will focus on blue sky research and its possible contributions to the developing energy system in various countries. With input from speakers representing public authorities, research institutes and the private sector, the participants will discuss the rising demand for innovation, specific technologies, various models for applying public funds, target-oriented R&D programs and reasonable incentives to harvest the lessons and results of blue sky science for the development of the energy system of the future.

## **Target Audience**

In addition to EGRD members and national experts, we are seeking input from RD&D decision-makers, strategic planners, and program managers from industry, academia, think tanks, national laboratories, and government. Participation is by invitation only.

## **Outcomes**

The workshop will result in a summary report that identifies challenges concerning basic research and best practice examples in various countries and technology sectors. The report will identify priorities and gaps in current programs for RD&D planners, and make recommendations. The workshop summary and presentations will be made available on the workshop web page.

## **Questions for discussion**

Questions to be addressed by the participating experts are listed below.

- *What are the drivers for government basic science programmes: science, society or both?*
- *What are the linkages between basic research, applied science and disruptive innovation?*
- *How can such lessons be applied to guide or improve future public investments in energy-related basic science research?*
- *What are the means for transitioning BSR outcomes to innovative energy-related products?*
- *Which current topics in basic science could potentially have a big impact on the energy sector?*
- *What are the most effective framework conditions for stimulating BSR schemes?*
- *At what point is industry involved in basic science programmes or their outcomes?*
- *What are the processes that lead to a disruptive innovation? What are the effects on socioeconomic issues (economy, lifestyles)? Are they seen as being positive or negative?*
- *What lessons can be drawn from the history of blue sky research and various government innovation models, in terms of best practices and disruptive, but productive innovation?*
- *Can disruptive innovations for the energy sector be anticipated? If so, how could these horizon scanning efforts be integrated into programme planning?*

# AGENDA

## DAY 1 – Wednesday, 14 June 2016

### Session 1: Introduction

*The Session provides background and context for the workshop. It reminds participants of the purpose, interactive nature of presentations, dialogue and social interactions, and the expected outcomes, and post-meeting activities and communications.*

*Chair: Gavin Harper*

08:30	Registration		
9:00	Welcome		Prof. Martin Freer, University of Birmingham
9:15	Introduction		Rob Kool, Chair, EGRD
9:30	1	Blue Sky Research	Ryan Bayliss, Oxford University
10:00	2	Disruptive Innovation	Carrie Pottinger, IEA
10:30	Coffee break		

### Session 2: From Blue sky research to new emerging technologies – and beyond

*This session reviews the contribution of BSR on long-term sustaining technologies and/or shorter term disruptive technologies and the prospects for breakthrough innovation.*

*Chair: Birte Holst-Jorgensen*

11:00	3	Sustainability in turbulent times	Mike Colechin, Energy Technologies Institute
11:30	4	Battery technology and basic science	Prof. Peter Slater
12:00	Lunch		
13:30	5	UK cyber programme	Richard Thomas, Cyber Security, University of Birmingham
14:00	Discussion		

### Session 3: Converging and enabling technologies for energy

*This session reviews the elements and mechanisms of BSR and disruptive innovation and how they may play a role in future energy paradigms.*

*Chair: Herbert Greisberger*

14:30	6	Reducing critical materials through chemical catalysis	Prof. Joe Wood, Birmingham Centre for Strategic Elements and Critical Materials
15:30	7	Foresight applied to energy	Artur Majewski, Fraunhofer UMSICHT
16:00	Coffee break		
16:30	8	Welcome to the ETA-Factory	Ann-Christin Frensch, TU Darmstadt
17:30	Discussion		
18:00	Close day 1		

# AGENDA

## DAY 2 - Thursday, 15 June 2017

### Session 4 : Use-inspired basic research and innovative processes

*This session focuses on innovative processes and successful examples of use-inspired basic research, its constituting technological components and the prospects for breakthrough innovation.*

Chair: Alexander Mclean			
9:00	9	The promise of fusion	Prof. Ian Chapman, CEO, United Kingdom Atomic Energy Authority
9:30	10	Spin-offs from space	Prof. Stuart Irvine, Centre for Solar Energy Research, Swansea University
10:00	11	Innovations in Japan and negative CO <sub>2</sub> emission technology	Atsushi Kurosawa, Institute of Applied Energy
10:30	Coffee break		
11:00	12	The quantum technologies hub	Prof. Kai Bongs, UK Quantum Technology Hub
11:30	13	Bringing nanotechnology into LEDs	Jaime Gomez Rivas, Technical University Eindhoven
12:00	Discussion		
12:30	Lunch		

### Session 5: Policy and regulatory frameworks

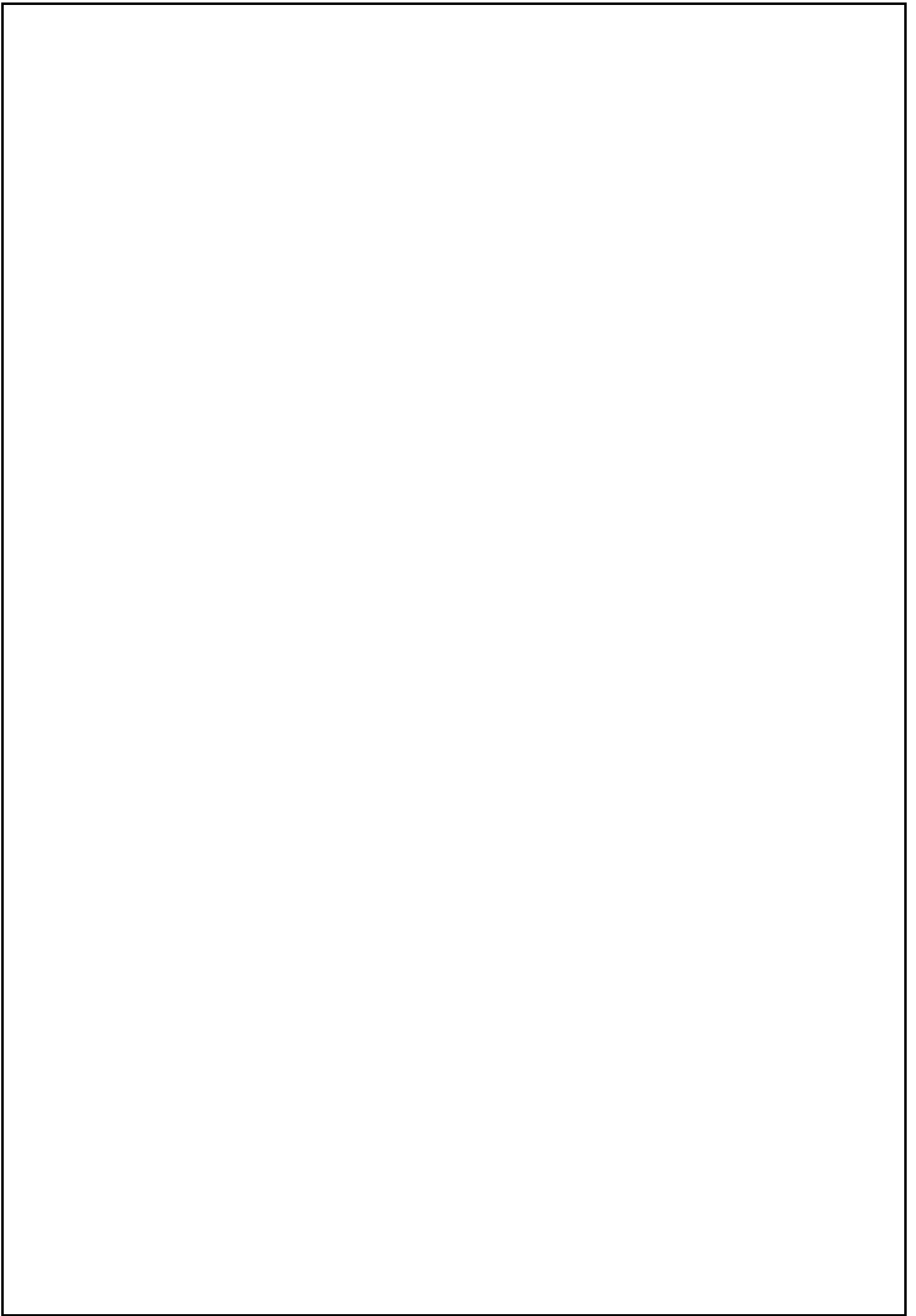
*The session will review best practice in establishing BSR programmes, including calls for tender, organisation, management, reporting and evaluation.*

Chair: Rob Kool			
13:30	14	Integrating disruptive innovation into energy foresight	Jonathan Radcliffe, University of Birmingham
14:00	15	Mission Innovation Materials Challenge	Nelson Mojarro Gonzalez, Energy Sustainability Fund for Europe, UK
14:30	16	New concepts in energy research, a pilot call for innovative projects	Tone Ibenholt, Research Council of Norway
15:00	17	Energy research under future and emerging technologies (FET)	John Magan, Directorate-General CONNECT, European Commission
15:30	Coffee Break		

### Session 6: Synthesis and takeaways

*The session will summarize the workshop, including conclusions and possible recommendations to policymakers and members of the IEA Committee on Energy Research and Technology (CERT).*

Chair: Johannes Tambornino	
16:00	Panel discussion <i>Moderators: Birte Holst-Jorgensen, Herbert Greisberger, Alexander McLean, Rob Kool</i>
16:30	Workshop conclusions
17:00	Meeting close



## SPEAKERS AND MODERATORS



**Professor Martin Freer** is the Director of the Birmingham Energy Institute which is the focal point for energy research at the University of Birmingham. He is also the Head of the School of Physics and Astronomy. The Birmingham Energy Institute brings together around 140 academics, with around £75 million in live research grants. Martin is also active in the region playing a key role in 'Energy Capital' an initiative which aims to position the West Midlands as a leading destination for energy innovation and inward investment. Martin has also been heavily involved with the Energy Research Accelerator, funded with £180m from government and industry. By training, Martin is an experimental nuclear Physicist. In 2005 he was awarded the Humboldt foundation 'Friedrich Wilhelm Bessel Prize'. In 2010 he was awarded the IoP 'Rutherford medal' for his contribution to the field of nuclear clustering. Prof. Freer holds a BSc (Hons) in Maths and Physics (Aston University) and a PhD in Nuclear Physics (University of Birmingham).



**Rob Kool**, Chair of the IEA Experts' Group on R&D Priority Setting and Evaluation, is Interim manager at the Netherlands Enterprise Agency (RVO.nl). Rob has over 30 years of experience with a broad range of topics in the energy field such as municipal energy policy, design of new efficient suburbs, district heating, build environment, joint implementation, CDM and leading international collaboration projects. Rob held leadership roles in many international fora, including the association of European Energy Agencies (EnR), vice-president of the European Council for Energy Efficiency. He is the Chair of the IEA Demand-Side Management TCP. Rob holds a business degree from the Netherlands Business School and a degree in biology (University of Utrecht).



**Ryan Bayliss** is a postdoctoral researcher in the Department of Materials, and a Fellow of the Oxford Martin Programme on Integrating Renewable Energy. His research aims to develop new materials, often through the exploration of inorganic crystal structures and the engineering of defects in solids that underpin next generation energy storage devices. His research efforts within the Oxford Martin School attempt to understand the potential technological developments possible (e.g. energy density, power density, cost, lifetime) in the energy storage sector and in collaboration with colleagues, attempt to understand the value of these various energy storage devices. He was also a member of the multi-valent thrust of the US Department of Energy 'battery hub', the Joint Center for Energy Storage Research (JCESR) based at Argonne National Laboratory. He earned Bachelors and Master's degrees in chemistry (University of Birmingham) in materials science (Imperial College London).



**Carrie Pottinger**, Programme Manager for the Technology R&D Networks at the IEA, oversees a vast network of 6,000 experts participating in the 40 international R&D groups supported by the IEA (Technology Collaboration Programmes, or TCPs). With more than 25 years cumulative energy knowledge and analysis, particularly in the areas of energy statistics, energy policies and technology and R&D, including leading or contributing to 30 published works. She currently serves as Secretary to the IEA Experts' Group on R&D Priority-Setting and Evaluation and the Fusion Power Co-ordinating Committee, and led recent efforts to revise the evaluation and review process for the TCPs on behalf of the Committee on Energy Research and Technology. Ms. Pottinger holds a degree in Communications (University of Washington) and has studied economics, data analysis and price forecasting.





**Dr. Birte Holst Jørgensen**, Technical University of Denmark, is vice chair of the IEA EGRD. She is an experienced researcher and practitioner in the field of new energy technologies and systems, where she has specialised in energy R&D strategies and technology policies at national, European and international level. She is Principal Coordinator in sustainable energy at the Sino-Danish Centre for Research and Education, a strategic co-operation between the Danish universities, the Danish Ministry of Science, Technology and Innovation and the University of the Chinese Academy of Sciences and the Chinese Academy of Sciences. Ms. Jorgensen holds a M.Sc. in Business Economics (Copenhagen Business School) and a Ph.D in Political Science (University of Copenhagen).



**Mike Colechin**, Partnership Manager for the Energy Technologies Institute (ETI), has over 20 years' experience in the energy sector. ETI brings together engineering projects that accelerate innovation that helps the UK meet its long term energy objectives. His role is to ensure that the ETI delivers value to its stakeholders, including both public and private sector funders and the wider community of industry, public sector and academic players involved in the delivery of low carbon energy in the UK. Prior to joining the ETI, Mike spent 15 years with E.ON, first as a Combustion Engineer and subsequently as a part of E.ON's R&D Management Team. He holds a B.Eng. (Brunel University), is a Chartered Engineer (Member of the Institute of Mechanical Engineers) and earned a PhD in Mechanical Engineering (University of Nottingham).



**Prof. Peter Slater** is Professor of Materials Chemistry in the School of Chemistry, University of Birmingham. He has been working in this area for 25 years on a range of topics, including Li/Na ion batteries, fuel cells, high temperature superconductivity, fast ion conductors, magnetic materials and structural studies of inorganic solids. He is an expert in the characterisation of ionic and electronic conduction in solids, and has received particular international recognition for his work identifying the key defects and conduction pathways in solid oxide fuel cell and Li ion battery materials, as well as his work in developing novel strategies to new materials in these areas. He also is head of the Solid State Chemistry section at UoB, chair of the IU crystallography group, and a member of the Diamond Light Source panel.



**Richard Thomas** is a Doctoral Researcher in the Security and Privacy Group at the University of Birmingham, a GCHQ Academic Centre of Excellence, working as part of the SCEPTICS Project. As part of his work, he has analysed the security of the UK and European Rail Networks, including the incoming European Rail Traffic Management System (ERTMS) Standard. Through this analysis and working with industry, Mr Thomas has proposed a number of recommendations to ensure that the ERTMS Standard is 'Secure by Design'. He also contributes to the SCEPTICS Project, which looks at threats to Rail and Energy through a methodology which can be applied by the industry to identify critical systems. He holds a BSc. in Computer Science (University of Birmingham) and a M.Sc. in Computer Security (University of Birmingham).



**Dr. Herbert Greisberger** is the Managing Director of the Lower Austrian Energy and Environment Agency where his projects focus on energy and innovation with a special focus on sustainable buildings and renewables. Mr. Greisberger is also scientific manager of the Austrian Futurelab focusing on long-term developments and their consequences for society. He was formerly the senior scientist on R&D, innovation and energy technologies for the Austrian Energy Agency and the Austrian Society for Environment and Technology. Mr. Greisberger is also a lecturer at the Institute for Research and Education focussing on energy economy and energy management. Mr. Greisberger studied economics (University of Graz and Vienna) and holds a PhD (University of Stuttgart).



**Prof. Joe Wood** leads the Catalysis and Reaction Engineering research group in the School of Chemical Engineering. He has published 86 refereed research articles including journal papers and book chapters, plus 63 conference papers covering a range of topics in catalysis, catalytic reactor operation and environmental engineering. He has received major grants from EPSRC and industrial funding from Johnson Matthey, E.ON and Petrobank Energy and Resources Ltd. Prof. Wood carries out research on upgrading of heavy oil, capture of carbon dioxide from industrial sources, catalyst development and testing, reactor design and engineering. He earned a BEng in Chemical Engineering with Environmental Protection (University of Loughborough), a CEng, MChemE (Institution of Chemical Engineers), and a PhD in Chemical Engineering, (University of Cambridge) as well as a postgraduate certificate in Teaching and Learning in Higher Education (University of Birmingham).



**Artur Majewski**, is a Research Fellow in the School of Chemical Engineering at University of Birmingham. Artur has published 21 scientific articles in journals and books, and has wide-ranging research interests in chemical engineering with particular focus on hydrogen production and fuel cells application. He joined the Centre for Fuel Cells and Hydrogen Research at School of Chemical Engineering at University of Birmingham in June 2008. His recent work has focused on hydrogen production using electrochemical, physicochemical and biological methods. He was working on development and evaluation of solid oxide fuel cells (SOFC) stacks and cells. He took part in several international projects related to hydrogen production and fuel cells technology. Artur holds a PhD (Koszalin University of Technology, Poland).



**Ann-Christin Frensch, M. Sc.**, is a member of the research group Sustainable Production at the institute PTW (Institute for Production Management, Technology and Machine Tools) at the Technical University of Darmstadt since December 2016. She now focusses her research on energy efficiency in production machines. Due to the large potentials of energy efficiency in the production sector, a model learning factory for energy efficiency has been opened at the TU Darmstadt in March 2016. In the ETA-Factory, students and skilled workers from industry can learn how to reveal and exploit energy efficiency potentials in production. The interdisciplinary team of the research group Sustainable Production and an innovative factory building are the perfect environment for a practical education. Ann-Christin graduated with a Master's degree in Mechanical and Process Engineering (TU Darmstadt).



**Jonathan Radcliffe**, a Senior Research Fellow at the University of Birmingham, has spent much of his career in and around government, covering science and innovation policy. Currently his research focuses on policy and techno-economic analysis of energy systems, in particular enabling the deployment and integration of energy storage. Jonathan is part of several projects funded by the research councils, including leading a £5m EPSRC-funded project, 'Manifest', which combines national energy storage facilities within a joint research programme; and as co-Director of the £4m national Energy Storage Supergen Hub, for which he leads engagement with policy makers and regulators. Other research projects consider processes and mechanisms for energy technology innovation. He joined Birmingham in 2013. Jonathan studied physics (Imperial College and Cambridge).



**Alexander Mclean** is a Programme Analyst with the United States Department of Energy where he provides programme support and policy analysis as it related to climate change and technology. Alex is an experienced policy analyst and project manager with a track record of successfully completed projects in a variety of fields, including the military, manufacturing, logistics, and academia. He holds a BA in BA, Psychology, Biology, Sociology (McDaniel College) and a MA in International Public Policy, Energy, Resources and Environment; International Development (Johns Hopkins University).



**Prof. Ian Chapman** is CEO of the UK Atomic Energy Authority and Head of the Culham Centre for Fusion Energy. He has held a number of international roles in fusion, including Chair of ITER international working groups. He has published over 110 journal papers, one of which was shortlisted for the Nuclear Fusion Award in 2013, and given 30 invited lead-author presentations at international conferences. He received the European Physical Society Early Career Prize in 2014, the Institute of Physics Paterson Medal in 2013, the IUPAP Plasma Physics Young Scientist Prize in 2012 and the Cavendish Medal for Best early-career UK physicist in 2011. He was made a Fellow of the Institute of Physics in 2013 and became a visiting Professor at Durham University in 2015. Ian received a PhD in Plasma Physics (Imperial College).



**Prof. Stuart Irvine** is Director of the Centre for Solar Energy Research (CSER) in the College of Engineering, Swansea University and is based in the OptIC Technology Centre (North Wales) along with the CSER team. He also chairs the Institute of Materials Mineral and Mining (IOM3) Energy Materials Group that has a broad view over the application of materials in energy generation and the challenges faced with both renewable energy generation and large power generation. He pioneered research on thin film solar cells and advanced thin film materials for the opto-electronics industry. This resulted in over 200 journal and conference publications and resulted in 10 patents. He received his B.Sc degree in Physics (Loughborough University), a Ph.D in Physical Metallurgy and Science of Materials, and D.Sc in Physics (University of Birmingham).



**Atsushi Kurosawa** is Director of the Global Environmental Program, Research and Development Division at the Institute of Applied Energy (IAE). He has led many energy and environment related projects. His current research focuses on integrated assessment of global climate change and energy research & development strategy, by developing integrated assessment model GRAPE and TIMES-Japan model. He has held visiting positions at the Stanford University in USA, and the Research Institute of Innovative Technology for the Earth. He also serves as Visiting Professor of Kyushu University, Lecturer of Tokyo University of Agriculture & Technology, Visiting researcher of Japan Science and Technology Agency, Fellow of New Energy and Industrial Technology Development Organization and visiting researcher at University of Tokyo. He earned a B.S. in nuclear engineering (Nagoya University), an M.S. in nuclear engineering (Tokyo Institute of Technology), and a Ph.D., electrical engineering (University of Tokyo).



**Prof. Kai Bongs**, leads the Midlands Ultracold Atom Research Centre at the University of Birmingham where his work focuses on cold atom quantum sensors and quantum gas mixtures with applications to both science and space. Prof. Bongs leads, coordinates or participates in a number of international co-operative projects in these two highly specialised fields of science, including the European Project “iSense” (measuring gravity via a portable atom chip); the Engineering and Physical Sciences Research Council (EPSRC) Cross-Disciplinary Technology programme GG-TOP (sensing technologies to map the underground for urban infrastructure and archaeology); the European project Space Optical Clock-II and the QUANTUS (quantum gases in microgravity) and the European Space Agency Space-Time Explorer and QUantum Equivalence Principle Space Test (STE-QUEST). His work has contributed to high-impact publications and been cited over 2,000 citations (h-index of 21). Prof. Bongs holds degrees in Physics: Habilitation (University of Hamburg), Diploma (University of Hannover) and a PhD (University of Hannover).



**Jaime Gomez Rivas**, Dutch Institute for Fundamental Energy Research (DIFFER) and Eindhoven University of Technology, leads a team examining strong light-matter coupling and the potential applications of this phenomenon. In 2005 Jaime was appointed to research on surface photonics at the FOM Institute for Atomic and Molecular Physics (AMOLF) and in 2010 he was appointed as part-time professor at the University of Eindhoven. His group was partially located at Philips Research in Eindhoven in order to bring blue sky research into applications, in particular pioneering work on plasmonics for solid state lighting. From 2002 until 2005, Gómez Rivas worked as postdoctoral researcher at the RWTH technical University in Aachen (Germany) on THz spectroscopy and plasmonics. He received his PhD in 2002 from the *Universiteit van Amsterdam* for his work on light transport in disordered media.





**Nelson Mojarro Gonzale** leads Energy Sustainability Fund for Europe, an instrument created by the Mexican Government to strengthen basic and applied research, technological assimilation, adoption, development and innovation in four streams: energy efficiency, renewable energy, clean technology use and diversification of primary energy sources. The FSE supports and finances research, development and innovation projects (R&D+I) linked directly with higher education institutions and research centres in the country. He is Mexico's main contact point for Mission Innovation and co-leads the Business and Investors Group in this initiative. He holds a BA in Economics (University of Guadalajara, Mexico), an MA in Industry and Innovation Analysis (University of Sussex), and a PhD in Science and Technology Policy Research (University of Sussex).



**Tone Ibenholt**, Research Council of Norway

Ms. Tone Ibenholt, works as a special adviser in the Research Council of Norway (RCN). She is in the Department for Energy Research. Her main responsibility in the RCN is to be coordinator for a Competence Center Programme within environmental-friendly energy research. She also works with funding of research infrastructures and more general issues related to evaluation and organisation of R&D-activity. Tone has been with the Research Council since 2010. She has more than 25 years of experience from ministries and public administration, mainly in the area of research policy, research organisation and funding. Tone holds a M.Sc. from the Norwegian University of Science and Technology.



**Dr. Johannes Tambornino** is the head of the unit Energy Strategies and Systems Analysis at Project Management Jülich where he is responsible for the R&D program on energy systems analysis funded by the German Ministry of Economic Affairs and Energy. He is leading a group that covers a broad range of topics along the energy innovation chain and currently serves as the German representative in the IEA Experts' Group on R&D Priority Setting and Innovation. He holds a PhD in mathematical physics and has actively pursued research in Quantum Gravity and Cosmology at different laboratories in Canada, France and Germany before changing fields and devoting his time to energy. Since 2013 he is working for Project Management Jülich.



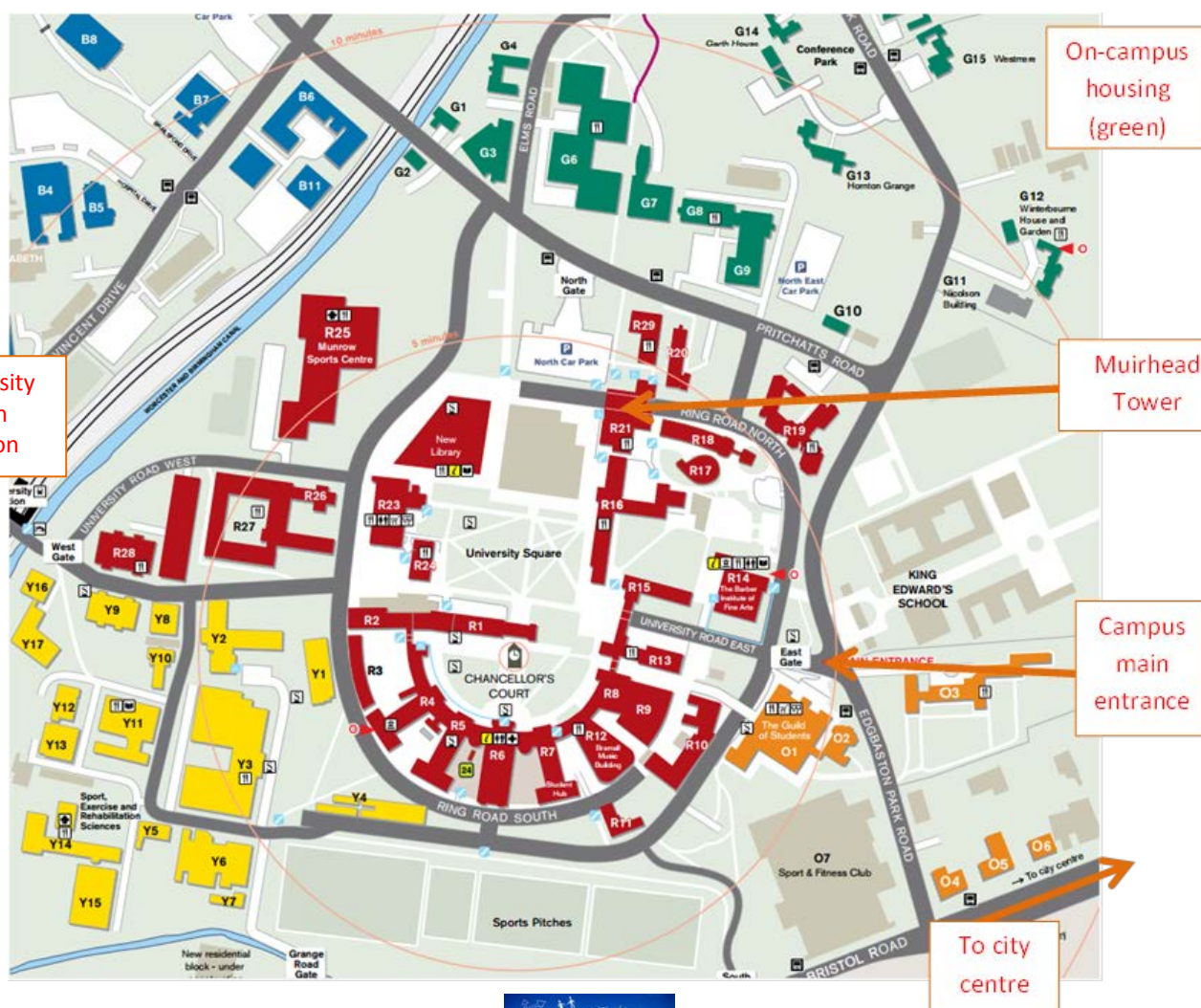
**John Magan** is Deputy Head of Unit for Future and Emerging Technologies within the Directorate-General CONNECT at the European Commission. For more than 20 years John has advanced research on microelectronics, photonics, microsystems and Digital Science research as well as in the coordination of the IT research programme. Previously he managed an industrial research team in Germany. John's interests include citizen science and public engagement in science as well as alternative and novel energy technologies. He received a PhD in laser physics (Trinity College Dublin).



For suggestions for accommodation contact Lucy Woods [L.Woods@bham.ac.uk](mailto:L.Woods@bham.ac.uk)

For information on the venue and access, see

<http://www.venuebirmingham.com/business-events/lunches-dinners-and-receptions/muirhead/>



Presentations and proceedings of the meeting will be made available at <https://www.iea.org/workshops/blue-sky-research-for-energy-technology-2017.html>

For further information about the EGRD, see <https://www.iea.org/about/structure/cert/egr/d/>