

FIVE YEARS OF ERA SKILLS

A REVIEW OF IMPACT AND ACHIEVEMENTS



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DEVELOPING INNOVATIVE, NETWORKED, AND HIGHLY SKILLED ENERGY RESEARCHERS TO CREATE A TALENT PIPELINE THAT WILL SECURE THE UK'S POSITION AS A LEADER IN ENERGY RESEARCH AND INNOVATION.

£2.4M

EPSRC Doctoral Training Partnership (DTP) and university funding.

**£4M +
£3.4M**

Centre for Postdoctoral Development in Infrastructure Cities and Energy (C-DICE), £4m grant and a further £3.4m being secured in matched commitments.

£300,000

HyDEX funding skills and training work package.

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WELCOME

EXECUTIVE SUMMARY

ERA Skills was established in 2016 and is led by Loughborough University to provide a unique energy centred researcher development experience for doctoral researchers across the ERA partnership.

The ERA partner universities committed £2.4m in EPSRC Doctoral Training Partnership (DTP) and university funding for studentships with the aim of meeting the demands of the changing energy landscape, by increasing the supply of highly trained, skilled postgraduates across the spectrum of energy research. Since its launch in 2016, 143 students have engaged with the ERA doctoral training programme, benefiting from 25 bespoke researcher development events and activities. The ERA Skills programme is allocated a budget each year, and is managed and operationalised by the Skills Manager with support from the Head and Academic Leads for ERA Skills. Currently ERA Skills has over 50 actively engaged researchers from all Midlands Innovation (MI) partners. This report provides a summary of the key ERA Skills achievements to date, and the benefits to the participating universities, with suggestions for the future direction of the programme.

Key highlights:

- Of the 19 ERA doctoral researchers who have graduated, 15 are employed in the R&D sector – eight are employed as university researchers, and the remainder work as researchers in the industrial sector.
- Thirty four of the 57 doctoral researchers enrolled on the ERA Skills programme published during the period 2016-2020, with a total citation count for all of the resulting scholarly outputs being 1,249. Over 15% of these were in the top 10% of the most-cited outputs in their field (as indexed by Scopus), and over 55% of these appeared in journals in the top 10% by CiteScore percentile illustrating their visibility. This suggests that ERA Skills doctoral researchers are producing highly visible and well cited scholarly outputs.
- ERA Skills doctoral researchers have made valuable contributions to research including:
 - ▶ Three doctoral researchers being part of a team of engineers from Loughborough University that have designed and built a unique low-cost, non-electric ventilator in response to the Covid-19 pandemic.
 - ▶ ERA Skills alumni Dr Argyrios Anagnostopoulos, University of Birmingham, was awarded a UKRI-ISCF Transforming Foundation Industries Network+ funding for the ‘SANDTHERM: Deployment of a medium-high temperature waste heat recovery unit based on foundry sand’.
 - ▶ Members of ERA Skills from across all university partners have been actively involved in engagement and outreach activities, for example at the Big Bang Fair at NEC Birmingham, Pint of Science in Coventry, Birmingham, and Loughborough, presenting as part of the University of Warwick Christmas lecture series and creating content for Black History Month.
- Due to the ERA Skills programme, further funding has been secured that builds on this work and expertise from Research England:
 - ▶ In 2020, Research England funded the Centre for Postdoctoral Development in Infrastructure Cities and Energy (C-DICE), with a £4m grant, and with a further £3.4m being secured in matched commitments.



We have also invested in the skills the British workforce will need for these new high wage green jobs, though our Lifetime Skills Guarantee"

UK Government Net Zero Strategy: Build Back Greener

- ▶ In 2021, Research England funded HyDEX Hydrogen development and knowledge exchange, with a £5m grant of which £300,000 is dedicated for the HyDEX skills and training work package.
- ▶ ERA Skills is being utilised by universities and individuals to leverage funding, for example through providing letters of support outlining the advantages to the projects and individuals of having access to ERA Skills.
- ERA Skills played a role in attracting funding for collaborative CDTs across the MI partners including CENTA (MI partners are Birmingham, Leicester, Loughborough, Warwick and Cranfield) and SusHy (MI partners are Nottingham, Loughborough, and Birmingham).
- ERA Skills contributes towards embedding a strong research culture and commitment to researcher development, which can be evidenced in HR Excellence plans, reviews, and REF environment statements.
- With an appropriate overview of the benefits being linked into university recruitment practices, participation in the ERA Skills programme could be a valuable tool for recruitment of PhD students, including widening participation into research careers due to the active promotion of EDI (equality, diversity and inclusion) in energy research.
- The benefits of the ERA Skills Programme for individual members include:
 - ▶ Access to dynamic network of researchers tackling energy-related societal challenges.
 - ▶ Opportunity to co-create researcher development activities.
 - ▶ Mentoring and support from leading academics.
 - ▶ Access to first class research facilities and equipment across the ERA partnership.
 - ▶ Free membership of the Chartered Energy Institute.
 - ▶ Access to bespoke training events, workshops, and conferences that would not be provided by an individual university, and often informed by and including our industry partners.
 - ▶ Development of professional skills, with an energy-context, for their research and career development including creative problem solving, team working and communications skills.
- ERA Skills activities can provide a valuable route to support future recruitment for our industrial partners.

ERA Skills will capitalise on its successes to continue to develop bespoke opportunities for energy researchers and enabling knowledge transfer. This will lead to seeking funding routes for new endeavours which complement and build on these strengths including creating a robust network across the career development pathway that aligns with the ERA Big Ideas and other initiatives geared to addressing the energy transition to net zero.

ERA SKILLS BACKGROUND

The purpose of the Energy Research Accelerator (ERA) is to work with UK government, industry, and the higher education sector to undertake innovative research, develop the next generation of energy leaders, and demonstrate low carbon technologies that help shape the future of the UK's energy landscape.

ERA draws upon the expertise and world-class facilities of the Midlands Innovation (MI) group of universities (Aston, Birmingham, Cranfield, Keele, Leicester, Loughborough, Nottingham, and Warwick), plus the British Geological Survey. With an initial funding of £60m, managed through Innovate UK, within a short space of time, ERA has delivered beyond the original expectation. ERA has created 23 new research facilities, obtained £120m of industrial funding and close to £450m of total value in terms of new investments in energy research and development.

ERA established the 'Skills' strand of activity in 2016 to develop innovative, networked, and highly skilled energy researchers to create a talent pipeline to secure the UK's position as a leader in energy research and innovation, and to facilitate knowledge transfer between researchers and industry to help accelerate the downstream impact of ERA-related research.

ERA partner universities committed £2.4m in EPSRC Doctoral Training Partnership (DTP) and university funding for studentships to recruit 33 postgraduate research students as part of this ambitionⁱ, resulting in three consecutive ERA Skills cohorts starting in 2016/17, 2017/18 and 2018/19. The number of doctoral students recruited during this stage far exceeded the original commitment, with 57 enrolling in the ERA doctoral training programme during this time.

From 2019 ERA Skills was extended to all energy or net-zero focused doctoral researchers from across the MI partnership, becoming the ERA Skills Academy in 2020 to extend the opportunities along the career pipeline. This resulted in a further 114 doctoral students becoming ERA Skills members over the next three cohorts, 2019/20, 2020/21 and 2021/22 (recruitment for 2021/22 cohort is on-going) demonstrating that there is appetite amongst MI doctoral students to engage with ERA Skills. A breakdown of engagement by ERA partner HEIs can be viewed in [Appendix 1: ERA Skills engagement across the ERA partnership](#).

ERA Skills aims to develop, support, and maintain a dynamic multidisciplinary network of researchers supported by world class expertise and facilities to tackle the societal and technical challenges required to meet both national and regional green growth and net-zero carbon agendas such as the UK government's [Ten Point Plan for a Green Industrial Revolution](#)ⁱⁱ and [Net Zero Strategy: Build Back Greener](#)ⁱⁱⁱ, and the [Ten Point Plan for Green Growth in the Midlands Engine](#)^{iv}.

The ambition of ERA Skills is to provide researcher development opportunities beyond those which could be provided at a single ERA partner to ensure that the Midlands, and UK more widely is equipped to stay at the forefront of energy innovation.

It provides a diverse range of skills development opportunities including bespoke energy and net-zero training, as well as opportunities for individuals to develop their transferable skills within an energy related context ([Appendix 2: Event Highlights](#), provides details on developmental opportunities which were offered during the past five years).

The type of skills delivery is crafted to align with both ERA stakeholders, industry, and UK governmental policy recommendations and requirements, including, for example, the Researcher Development Concordat^v and the [UK government R&D pipeline report](#)^{vi}.

SKILLS IMPACT



£2.4M
EPSRC DOCTORAL
TRAINING PROGRAMME

143 STUDENTS
ENGAGED IN THE ERA DOCTORAL
TRAINING PROGRAMME

25 BESPOKE RESEARCHER DEVELOPMENT
EVENTS AND ACTIVITIES

CURRENTLY
50 ERA SKILLS
RESEARCHERS
ACTIVELY
ENGAGED
MI UNIVERSITIES

In the R&D pipeline report it is stated that skills or knowledge sets associated with research and development jobs are often transferable in nature with creative problem solving and team working skills being in demand. By providing doctoral and postdoctoral researchers with opportunities to develop their transferable skills through activities and events that are embedded in real-life energy-related challenges, ERA Skills increases the supply of highly trained, skilled postgraduates across the spectrum of energy research with the skill set required to meet future skills needs.

**KNOWLEDGE
RECOGNITION**
STUDENTS WORK
CITED BY OTHER
SOURCES **1,249
TIMES**

**OVER 15% IN THE
TOP 10%
MOST-CITED OUTPUTS
IN THEIR FIELD**
AS INDEXED BY SCOPUS

**OVER 55%
APPEARED IN
THE TOP 10 CITED
JOURNALS**
CITED BY CITESCORE

ERA SKILLS

IMPACT AND BENEFITS

ERA Skills is helping provide the highly skilled individuals required to fill the c380,000 R&D jobs that the R&D Pipeline report^{vii} states will need to be filled by 2027 in order to meet the government’s roadmap outlined in the [Build Back Better: our plan for growth document](#)^{vii}.

Most doctoral researchers who have been associated with ERA Skills and have graduated, are employed in the research and development sector. Of the 2016/17 cohort (currently the only complete cohort where all doctoral researchers to have completed their PhD) we have destination information on ten of the thirteen members of the cohort, with all ten being employed in the R&D workforce, four as research fellows at universities and the remaining six working in industry. Of the eight doctoral researchers from the 2017/18 that have graduated we have destination information on seven of them, five of whom are employed in the R&D workforce (four in universities and one in industry). In addition to the national benefits of ERA Skills, there are distinct benefits and impacts on a variety of stakeholders including Midlands Innovation, ERA partner institutions, doctoral researchers, and ERA’s industrial partners.

ERA SKILLS IS A FLAGSHIP PROGRAMME FOR DOCTORAL RESEARCH DEVELOPMENT

ERA Skills has developed a unique doctoral researcher development experience, embedding transferable skills into subject specific delivery, providing access to world class facilities, and delivering technical skill development. In doing so we have created a flagship model and variety of resources that could be used as a platform to launch a Midlands Innovation wide Skills programme. The UKCRIC doctoral skills network have called upon the expertise of the ERA Skills Programme to help advise and shape their network, and the ERA Skills manager ran an ARMA workshop on “How to Facilitate Building an EDI Resilient Network of Researchers”, both of which have raised the profile of MI and ERA and demonstrate that the model developed is of value to the community. Similarly, the UK Council for Graduate Education invited a presentation on ERA at its International Conference in 2019. In

addition, specific educational resources developed by the ERA Skills team have been shared with the researcher development community via the Vitae 2021 conference, and the UK Mock COP working group, each receiving positive feedback. Demonstrating that the resources and model of researcher development created by the ERA Skills team could be adapted to form the basis of a MI-wide Skills training programme that has Equality, Diversity and Inclusion (EDI) as an integral part of the delivery or be used as a model for CDT/ DTP training for doctoral researchers. This could be a valuable resource for the ERA partners when designing and delivering CDT or DTPs.

ERA PARTNER INSTITUTIONS

Developing a unique and highly regarded skills programme for doctoral researchers has enabled us to leverage the skills and experiences gained to attract further funding for both researcher development and research projects involving ERA partner institutions. The skills and expertise that



We have created a flagship model and variety of resources that could be used as a platform to launch a Midlands Innovation wide Skills programme.

Photo shows ERA students at the first Energy Trader Workshop

the ERA Skills Team have been pivotal in designing and obtaining c£4m funding from Research England Development Fund for the Centre for Postdoctoral Development in Infrastructure Cities and Energy (C-DICE). In addition, having skills expertise within ERA enabled us to include skills and training work packages into research grants, such as the £5m Hydrogen development and knowledge exchange (HyDEX) grant which has a dedicated skills and training work package with a budget of almost £300,000.

As well as obtaining funding for ERA-wide grants, ERA Skills has also recently supported grant proposals from individual academics/institutions for funding from bodies such as EPSRC, Leverhulme Trust, and the Nuclear Decommissioning Authority (NDA), outlining the advantages and benefits available. This provides a unique advantage to applications from ERA partner institutions and is something that can be exploited and promoted in the future. The next EPSRC CDT call is another opportunity where ERA Skills can provide a strategic advantage for ERA partners.

Furthermore, ERA Skills offers a variety of more indirect benefits to our partner institutions such

as contributing towards their research culture, (which can be used as part of REF statements and researcher concordat reports), aid in postgraduate and postdoctoral recruitment, and contributing towards their EDI agendas.

POSTGRADUATE RECRUITMENT

Engaging with ERA Skills gives postgraduate researchers the opportunity to develop their transferable skills in a subject specific way and to engage with a wider community of doctoral researchers. The 2019 Future PhD Student Survey carried out by FindAUniversity^x found that these factors were of high importance for future PhD students when considering applying for a PhD. The second most important driver for undertaking a PhD was gaining transferable skills, with subject interest being the primary driver – and 66% of respondents describe the ability to interact with other PhD students as ‘very important’. This affirms the value of cohort-based approach of ERA Skills and indicates that eligibility to participate in ERA Skills could be a valuable recruitment message for ERA partner institutions to attract future PhD

students. This survey also demonstrated that web resources were the most popular platform for PhD information seeking, with 95% of potential PhD students utilising university websites and 90% utilising independent websites. By comparison only 32% would attend a career fair and 23% would consult university career services. To aid in the recruitment of PhD students by partner universities, in 2021 we added a section to the ERA site which signposts prospective students to PhD opportunities offered by our HEI partners. This is a resource that we would like to capitalise on for the next round of PhD recruitment, highlighting specific PhDs from our partner institutions which are relevant to ERA research subjects.

In addition to direct recruitment of PhD students, ERA Skills raises the profile of the research and development environment and career opportunities at both our university and industrial partners, encouraging the next generation of doctoral students to become part of the energy R&D workforce.

95%
**OF PROSPECTIVE
PHD STUDENTS**
SEEK INFORMATION FROM
UNIVERSITY WEBSITES

2019 Future PhD Student Survey

EQUALITY, DIVERSITY AND INCLUSION (EDI)

Many undergraduate students who identify under protected characteristics are from backgrounds which make undertaking a PhD seem out of reach. ERA Skills has helped reduce this barrier to participation by actively involving pre-PhD level students with protected characteristics in activities, for example providing ERA Nuffield placements that are targeted at A level students from disadvantaged backgrounds, and running events for undergraduate students, such as the Mock COP, that attracted active a diverse population of participants. Through the delivery of ERA Skills events designed to increase undergraduate knowledge and awareness of our diverse research environments, and by engaging current ERA PhD students who themselves have a variety of protected characteristics to promote their projects, increases the potential of those students undertaking a PhD projects, ERA Skills increases the potential as the next step in their career path. This activity can help recruit undergraduate students from non-traditional and disadvantaged backgrounds.

ERA Skills actively celebrates and promotes EDI in energy research. For example, during Black History Month, ERA Skills Programme members celebrated black researchers via a co-created website (era.ac.uk/Black-History-Month-2021). This provided insights into famous black energy researchers both past and present. ERA Skills is actively involved in the EDI community, helping to promote inclusive robust networks, as evidenced by the ERA Skills Manager running the ARMA conference 'How to facilitate building an EDI resilient network of researchers'

workshop with an article, '[Building EDI Robust Networks](#)', published in issue 14 of The Protagonist.

DOCTORAL RESEARCHERS

ERA Skills provides opportunities over and above those available to researchers based at individual institutions. Doctoral students of the ERA Skills Programme attend regular webinars where they can find out about the latest research, innovation and commercial developments in green energy taking place across ERA's academic and industrial partners. Exposing students to the latest technologies provides them with the knowledge, understanding

and tools to adapt to the changing technological landscape. In addition, they benefit from mentoring and support from leading academics, and access to first class research facilities and equipment, from across the ERA partnership.

As well as accessing energy specific developmental opportunities, becoming an ERA Skills member also gives doctoral researchers access to a dynamic multidisciplinary network of researchers that fosters an active and engaging research culture with a support community that can encourage each other during their doctoral journey. This support is viewed as very valuable to ERA doctoral students, as can be seen from the two testimonials shown below.

WHAT OUR DOCTORAL RESEARCHERS SAY

“

As part of the first cohort of ERA, I had the opportunity to meet students from different universities in UK. One of the best things is sharing how you feel about your PhD at each stage and finding that our emotions about the work we were doing were similar.”

—Jorge López Ordovás, Aston University

“

ERA has made a difference in helping me gain skills that have helped in my early research career. From the trainings, workshops, events, and monthly check-ins, it has offered some context to the wider research going on at other universities and helped foster several good relationships.

The Net-Zero Heroes and the Black History Month webinars have been key highlights in the years showcasing engineers, technicians, and inventors who we were never really aware of. I hope others can experience what a difference this makes and be invested in making the most of what ERA provides within the research community. I found out about the importance of project management in research and now happy to have started my career in this profession after completing my PhD.”

—Tosin Adedipe, Cranfield University

ERA ENERGY RESEARCH ACCELERATOR

NET-ZERO HEROES

Black History Month 2021

George Washington Carver

George Washington Carver (1864 – 1943) can be thought of as the grandfather of biofuels. Along with Henry Ford, he came up with the idea / vision that petroleum is a finite resource that we would eventually run out of and thus we would need something else to power our cars. Together they worked on the idea of producing ethanol as a biofuel, and this is something that researchers still work on today. More than 60 years later, the ethanol-fuelled dreams of Carver and Ford are becoming a reality.

“

Highlighting the diversity of the ERA Skills Programme members and running EDI focused events shows undergraduate students who identify under protected characteristics that undertaking a PhD is a viable next step in their career.”

As members of the ERA Skills Programme, doctoral students have access to a diverse range of skills development opportunities and events where they can develop their transferable skills within an energy related context. By undertaking these developmental opportunities in multidisciplinary groups, students gain the ability to clearly explain their research to individuals from a wide variety of disciplines. They experience transferring their knowledge, ideas, and techniques to new disciplines or challenges, hence increasing flexibility and transferability in the future workforce.

Membership of the ERA Skills Programme also give doctoral researchers the opportunity to disseminate their research to the wider Energy community via conferences, student showcase events, and webinars such as our Net-Zero Heroes series.

As ERA is an Energy Institute Learning Affiliate Member, ERA Skills Programme doctoral researchers receive free Student Membership to the Energy Institute. This provides networking opportunities, library and e-library services, professional development opportunities and online exclusive access to Energy World monthly magazine.

POSTDOCTORAL RESEARCHERS

The majority of the postdoctoral researcher development opportunities are delivered through the Centre for Postdoctoral Development in Infrastructure Cities and Energy (C-DICE), a programme which leverages the capability of 18 leading research-intensive UK universities, bringing together the collective expertise of the UKCRIC universities with the partners of ERA. The overarching aim of C-DICE is to build and sustain the advanced skills base required to create a pipeline of world-class talent for the Infrastructure, Cities and Energy (IC&E) sectors, and accelerate progress towards a net-zero society by 2050. The Centre is supported through a £4m, four year investment from the Research England Development Fund.

There are four main strands of C-DICE activity:

- **The training strand**, which provides bespoke training and development activities linked to the UKCRIC and ERA facilities and achieving net-zero carbon emissions
- **The development strand** that provides placements and secondments with academic and industry partners
- **The sandpit programme** which will coalesce researchers in multi-disciplinary teams to

generate novel solutions to the net zero-carbon challenge (with the potential to win up to £30k in seed-corn funding)

- **The impact strand** that will deliver knowledge exchange events to maximise and disseminate the outcomes and benefits of the programme.

By working closely with C-DICE and providing several activities that combine both doctoral and postdoctoral researcher development opportunities ERA Skills enhances the pipeline between doctoral and postdoctoral researchers, providing doctoral researchers with role models from a variety of different backgrounds. C-DICE also provides opportunities to strengthen the links with new and existing ERA industry partners.

INDUSTRIAL PARTNERS

ERA Skills has a track record of working with ERAs industrial partners who have provided researcher development opportunities to our doctoral researchers through seminars, webinars, workshops, and interactions during our annual conferences. The monthly Net-Zero Heroes webinars that are aimed at business people, students, academics and professional services staff who are interested in finding out about the latest research, innovation and commercial

developments in green energy often have speakers from our industrial partners, for example EDF R&D UK Centre, Engie, and Trilateral have all participated in the 2021/22 academic programme. Getting input from ERA Industrial Advisory Board on ERA Skills activities helps to us shape the training we offer, ensuring that researchers are developing the right skill sets for research and business to meet their requirements. It can also provide a valuable route to support future recruitment.

In addition, industry has partnered with ERA to provide a limited number of placement opportunities, for example EDF energy provided an ERA Nuffield placement for an A level students from a disadvantaged background, and provided a placement as part of the ESRC Impact Acceleration Account Placements that support Social Science Post Graduate Researchers in gaining an innovation experience outside their PhD project and research team. Placement Students can bring new ideas and provide an additional resource to the host organisation, whilst forming an important part of their corporate responsibility of helping to develop the skills required for of the future of their industry. We would like to capitalise on these benefits by working with ERA's industrial partners to provide a greater number of placements, mentoring, and work shadowing opportunities in the future.



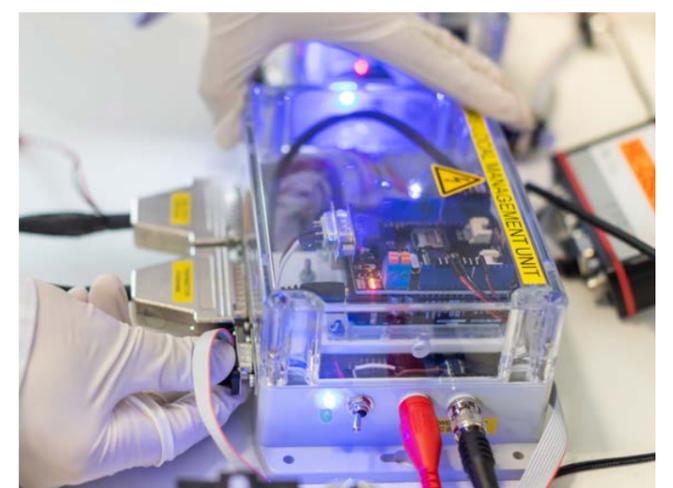
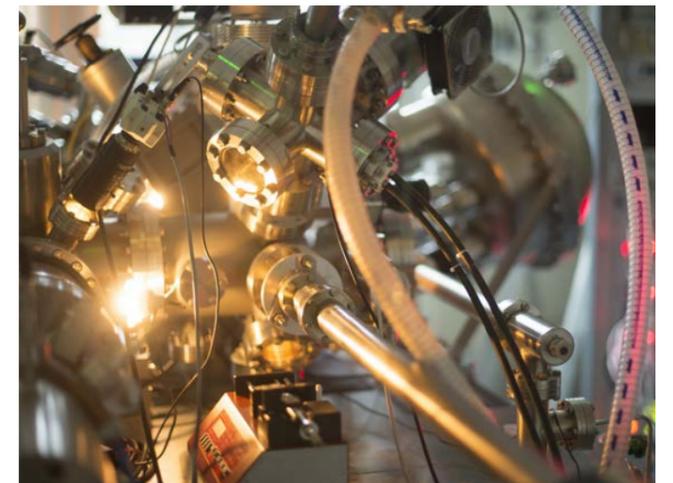
THE FUTURE

ERA Skills is now in a position to benefit from the broadened scale and scope of externally funded projects (C-DICE and HyDEX) which provide synergies and economies of scale, and to capitalise on the established identity, membership and alumni from the doctoral activities. This will enable us to foster an active and engaging research culture, providing researchers with the skills to be active participants in delivery of the ERA's energy research and innovation programme.

We will continue to actively engage with the ERA higher education partners to help promote doctoral researcher opportunities with a particular focus on attracting students from under-represented groups. There is also an opportunity to build on the ERA Skills work to seek additional collaborative funding with either industry or UKRI partners, for example to bid for Centres for Doctoral training in future rounds. ERA Skills also aims to facilitate knowledge transfer between researchers and industry to help accelerate the downstream impact of ERA-related research via increasing the opportunities for ERA doctoral and postdoctoral researchers to undergo secondment, mentoring and/or work shadowing with our industrial partners.

The ambition for ERA Skills is to contribute to the ongoing energy revolution through the development of researchers, by addressing the pressing demand for high-level skills in the energy sector required to meet the net-zero carbon and clean growth objectives by working with UKCRIC and other networks. This will continue to support the development of world-class talent to meet green growth and net-zero challenges, including extending our delivery along the skills pipeline, and attracting additional funding to provide developmental opportunities across the different stages of development, providing an integrated skills development programme for the research environment. We envisage such a programme would cover the following aspects:

- **Schools and undergraduates:** Coordinate a series of placements and secondments which will allow undergraduate and school-age students to experience the energy research environment, building on pre-existing successful placement models. These activities will help increase awareness of energy research as a desirable and viable career option.
- **Undergraduate and post-graduate:** Work with our partner universities to establish a joint energy teaching resource, encourage sharing of specialised energy teaching across the partners and provide opportunities for undergraduates and post-graduates to develop their transferable skills in an energy and/or net-zero focused environment.
- **The HyDEX programme** will provide level 3 and level 6/7 opportunities for hydrogen skills development for industry and business partners through dedicated CPD programmes linked to the ERA centres for doctoral training (CDTs) and programmes across the ERA partners. This will build on the platforms of the programmes Pollution Know-how and Abatement (POLKA, Keele) Sustainable Hydrogen (SusHy, Nottingham, Loughborough, Birmingham) CDTs, and the CDT in fuel cells and zero-carbon fuels – sustainable power, heat, and transport for the 21st century and current hydrogen and fuel cell CDT (Nottingham, Birmingham, and Loughborough).



- **Doctoral-level:** Provide high-level skills development at doctoral level (for example, placements, secondments, conferences, specialist skills training), creating cohorts of researchers, and attracting industry-matched funding to research industry-derived research challenges and address high-level skills shortages. Potential to bid for collaborative CDT funding or create PhD clusters with partners.

- **Postdoctoral:** Complementing and scaling the work of the recent £4m Research England Development Fund investment in postdoctoral researchers to establish the Centre for Postdoctoral Development for Research in Infrastructure, Cities and Energy (C-DICE), engaging ERA postdocs as a talent pipeline for working with industry.



- **Technicians:** Extending the skills programme to include technicians both with ERA partners and beyond. To deliver this, ERA will partner with the Research England TALENT programme to access specific expertise in relation to the needs and interests of technicians. We will also engage with the

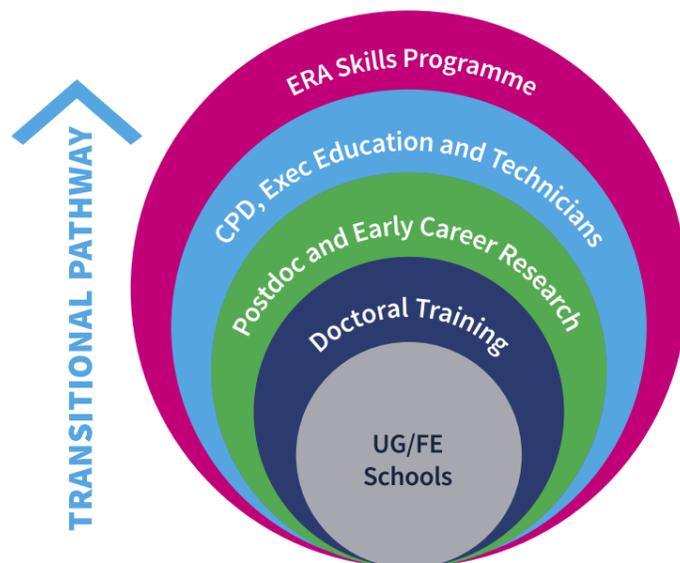
Midlands Innovation Technical Staff Strategy Group which brings together technical managers from ERA's partner institutions.

- **Continuing professional development:** Establish a suite of executive education packages, for UK industry (linked to the apprenticeships levy) and for the international market to cement ERA's place as a leader in research and skills, and to create a sustainable model. HyDEX will provide a number of dedicated hydrogen skills components to be added to existing apprenticeship programmes to broaden their applicability to this emerging sector, delivered across the region in key aspects of hydrogen production, storage, transport in collaboration with industrial partners through their training centres and facilities, and utilising the ERA demonstrator facilities.

To facilitate this, ERA will develop communities of practice centred around key net-zero research themes for skills development, provide networking across academic career stages and facilitate knowledge exchange with industry. This will form the basis of a network across the career development pathway for special interest groups that can concentrate on different aspects of research required to meet the net-zero and green growth agenda, bringing together PhD students, postdocs, technicians, research fellows and established academics and industry to accelerate the pace of research required for the transition to a carbon neutral society.



Figure 1: ERA Skills Programme



KEY

- Undergraduate/Further Education/Schools – Outreach activities/Apprenticeships
- DTP – Doctoral Training Partnership to PhD level
- Early career training – Postdoctoral and early career researcher support
- Lifelong learning – CPD and executive training
- Technicians – CPD for technical managers and specialists
- ERA Skills Programme

APPENDIX 1: ERA SKILLS

ENGAGEMENT ACROSS THE ERA PARTNERSHIP

ERA Skills has engaged with doctoral researchers from all across the partnership, figure 2 shows the number of students from each partner HEI that have become ERA Skills members, with figure 3 and figure 4 highlighting the number of doctoral and postdoctoral researchers that have participated in ERA showcase and conference events, and the number who have signed up to the monthly Net-Zero Heroes webinars respectively.

ERA SKILLS MEMBERSHIP

Each year ERA Skills has attracted new members, growing our researcher development network, figure 2 shows that we have successfully recruited new doctoral researchers from the majority of our partners each academic year since ERA Skills was established in 2016/17.

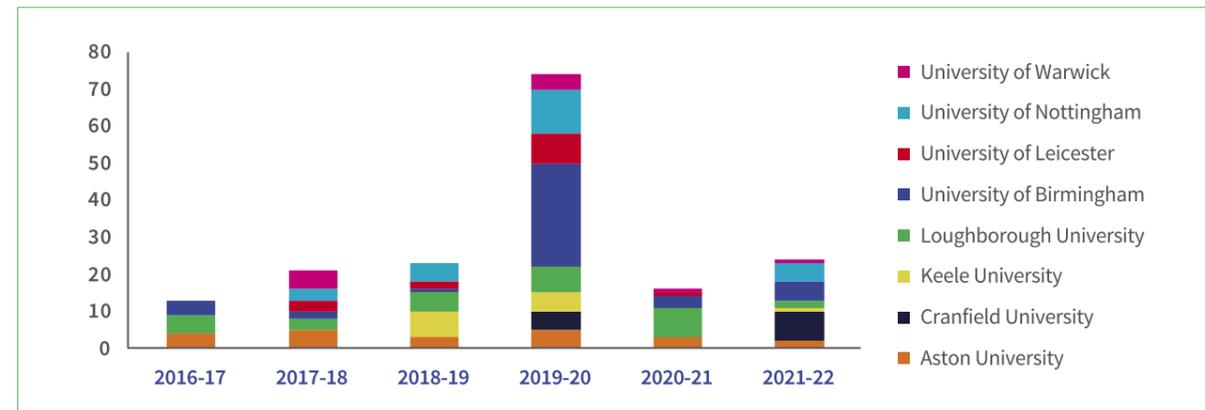


Figure 2: Number of new ERA Skills members by academic year. Please note recruitment for the 2021/22 academic year is on-going.

ENGAGEMENT WITH ERA ACTIVITIES

An indication of the engagement levels of doctoral and postdoctoral researchers can be taken from the number of delegates from each HEI that attend ERA Skills showcase or conferences. Figure 3 shows that there is larger engagement with doctoral researchers than postdoctoral researcher, as expected due to ERA Skills predominantly focusing on doctoral researcher development, however the level of engagement increases for the 2021 conference. This is again expected because the 2021 conference was a combined C-DICE and ERA event. Figure 3 shows that each of the partner universities have doctoral and/or postdoctoral researchers that engage with the Net-Zero Heroes webinars. These webinars are for students, academics and professional services staff who are interested in finding out about the latest research, innovation, and commercial developments in green energy. They are usually held on the third Wednesday of the month at 12:30-13:30.

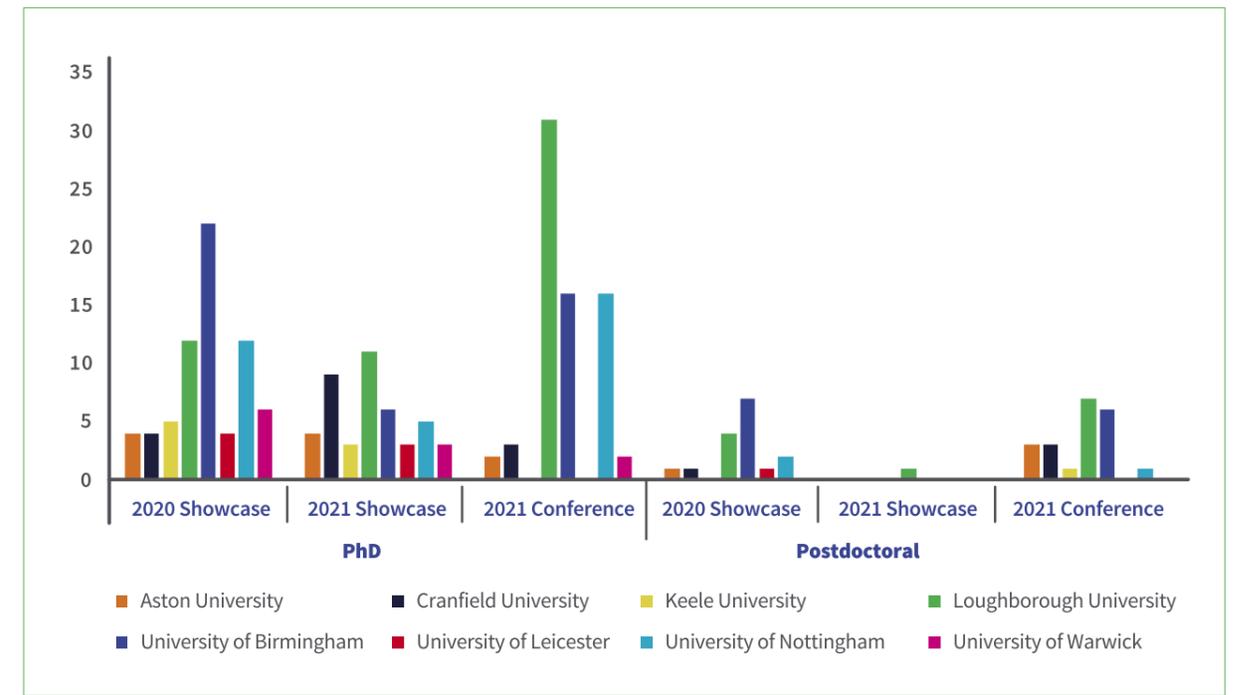


Figure 3: Number of ERA affiliated delegates at showcase events and 2021 conference. PhD numbers are on the left-hand side of the figure and postdoctoral engagement can be viewed in the right-hand side.

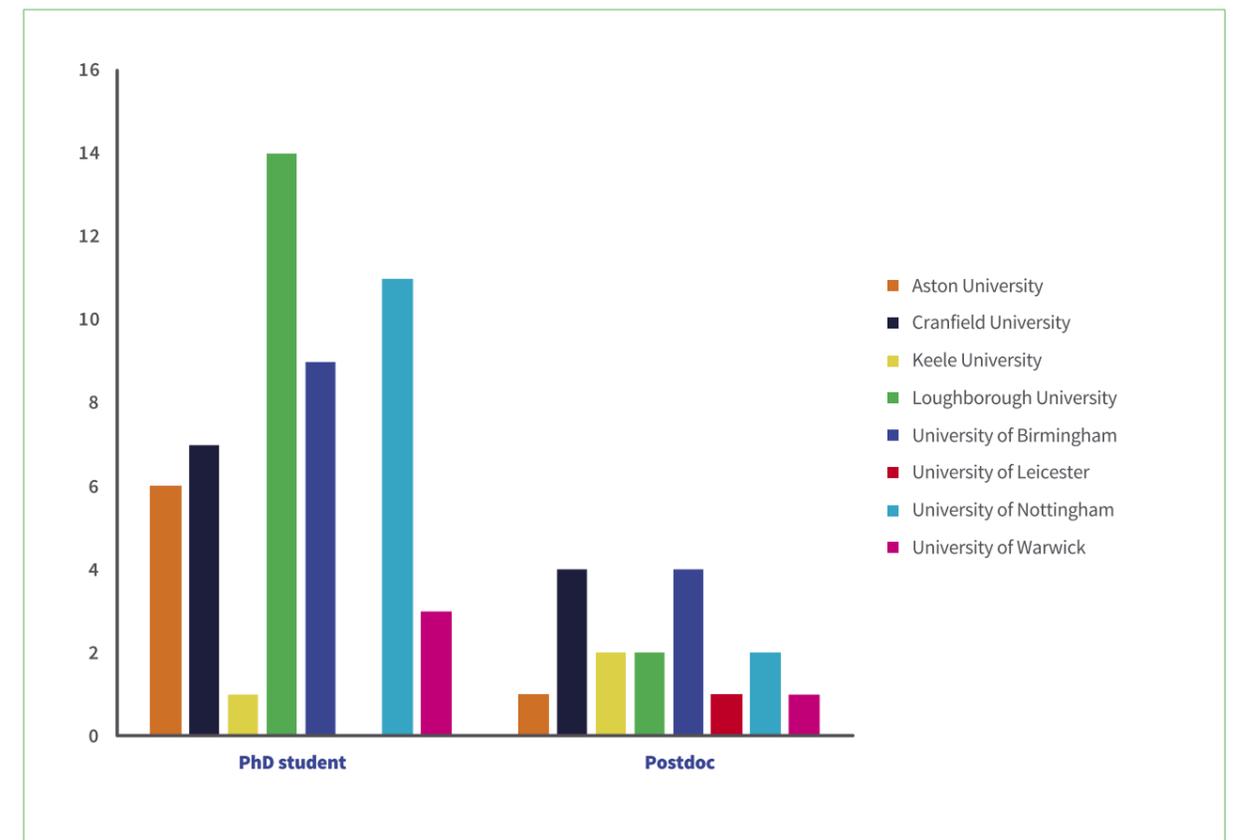


Figure 4: Number of doctoral and postdoctoral researchers who have signed up to receive information about the monthly Net-Zero Heroes webinars. Data taken on 09/02/2022.

APPENDIX 2: ERA SKILLS

EVENT HIGHLIGHTS

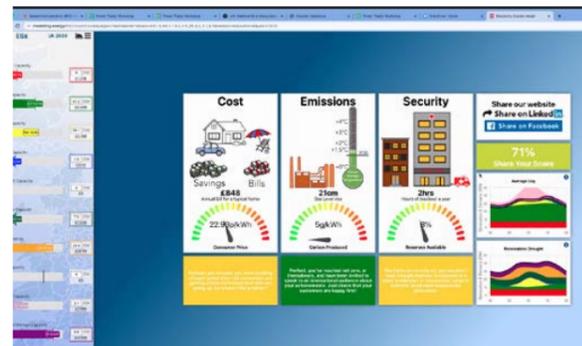
Each academic year ERA Skills has held at least one main event or activity with the aim of bringing the cohort together and providing them with skills development opportunities.

A list of these events can be found in [Table 1](#). The Covid-19 pandemic that started in early 2020 meant that most events for the academic year 2019/20 and 2020/2021 were delayed or changed to virtual events. This format worked well for some events such as the Energy 100 Challenge so these will remain virtual in the future, however some events, such as site visits, work better in person. Feedback from participants to the events indicates that students preferred events where they could meet students with similar interests from other HEIs and learn skills with an energy focus or transferable skills that were gained whilst working on an energy related topic. The two most popular events were the Power Trader Event and The Energy 100 Challenge.

A BRIEF LOOK AT OUR MOST POPULAR EVENTS

POWER TRADER WORKSHOP, IN-PERSON 2018 AND ONLINE 2022

This unique one-day workshop puts participants in charge of their own electricity company. The aim of the workshop is to run your electricity company in a way that keeps your customers' lights on, maximises profit and minimises carbon emissions. This event has proven very popular with students and has received very positive feedback:



“

The game-based learning is very engaging, and as Andy [Heuristic Games] said, we learn from our mistakes. I think the most important things in this game is teamwork, because without a solid team, we can't make fast decision and change strategy in each round.”

—Natalia Hartono, PhD student, University of Birmingham

ENERGY 100 CHALLENGE AND ENERGY 101 CHALLENGE, ONLINE 2020 AND 2022

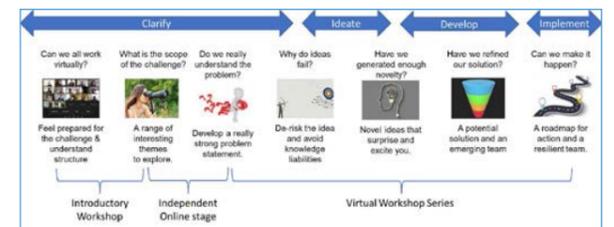
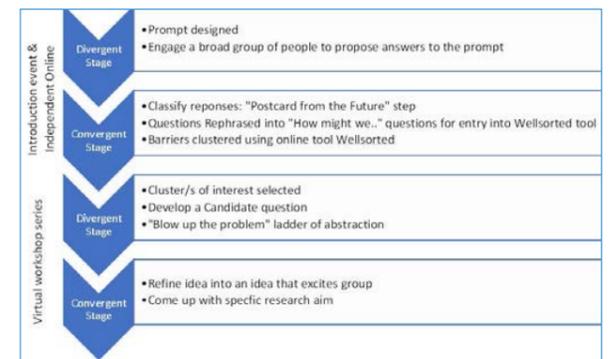
The ERA and C-DICE Energy 101 Challenge is a creative problem-solving challenge run by the Energy Research Accelerator (ERA) and is based on the UKRI sandpit and Know Innovation creative problem-solving strategies. Sandpits are defined by UKRI as having “a highly multidisciplinary mix of participants, some active researchers and others potential users of research outcomes, to drive lateral thinking and radical approaches to address research challenges”. The aim of these challenges is to help PhD students and postdoctoral researchers develop soft skills whilst tackling a real-life energy related problem.

In 2020 the problem tackled was “What are the technological, social and policy barriers that are stopping the Midlands becoming a low-carbon industrial cluster by 2030?” With the 2022 problem statement being “How might we develop an inclusive approach to reducing end user carbon footprints?”.

“

“It was great. I learned a lot about myself and other people. I have some new tools I have already started applying.”

—Anonymous



90%
OF PARTICIPANTS
SAID THEY WERE LIKELY
OR VERY LIKELY TO CARRY
FORWARD THE LEARNING
THEY HAD LEARNT DURING
THE COURSE

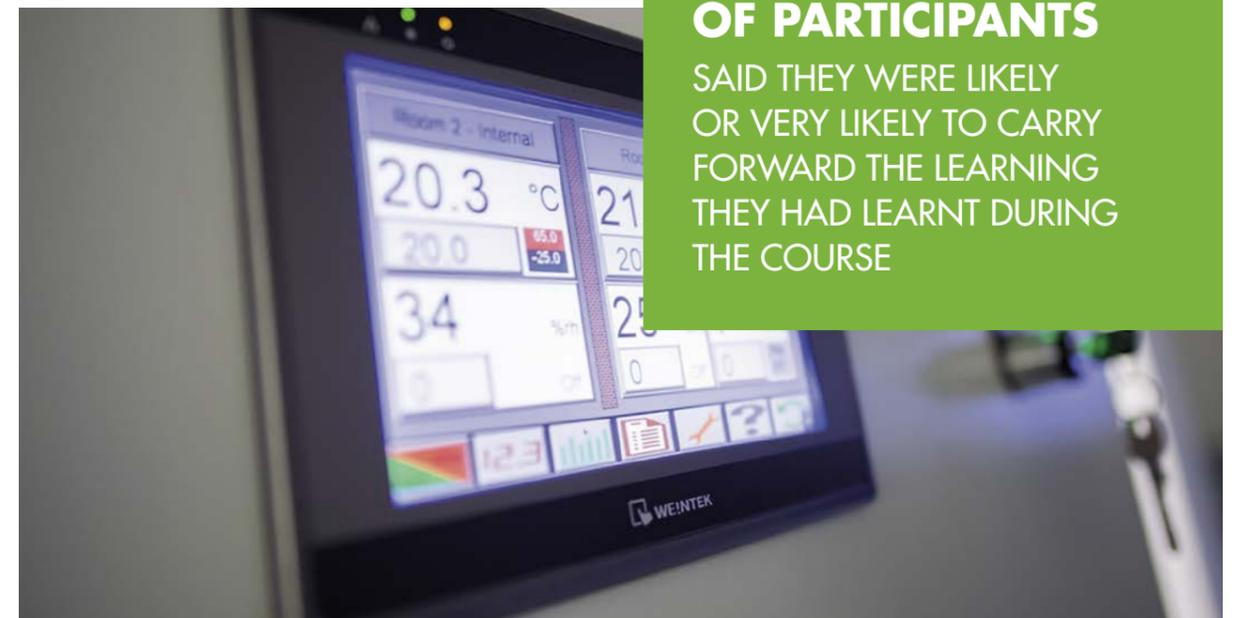


Table 1: Table of main ERA Skills events in reverse chronological order

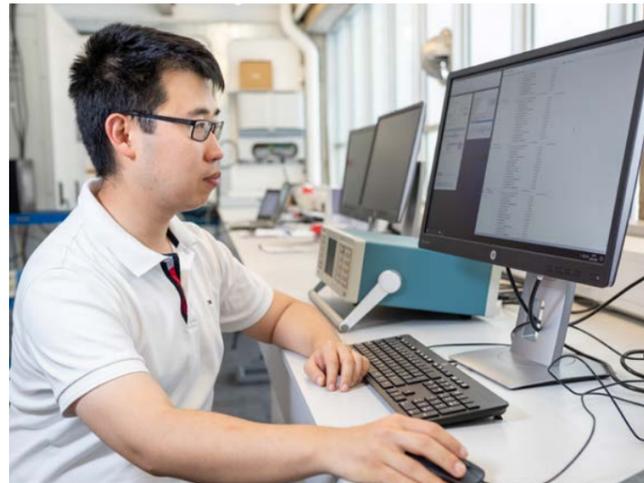
Event	Academic year
Energy 101 Challenge	2021/2022
Writing retreat	2021/2022
Power Trader workshop	2021/2022
Net-Zero Futures 21 conference Including: <ul style="list-style-type: none"> Motivational talks to inspire the next big step in your careers <ul style="list-style-type: none"> Dr Joanne Leach, Research Fellow, University of Birmingham: ‘My non-disciplinary research career (so far)’ Dr Andrew Jenkins, CEO and Founder of Kinewall Energy: ‘Creating significant scalable value through technology development to support the societal transition to net-zero’ Dr Katy Mahoney, Professional Development and Consulting: ‘Cars, carrots and coaching’ Keynote address by Dr Nina Skorupska – Chief Executive of REA, The Association for Renewable Energy and Clean Technology Panel discussion: Future challenges for net-zero and sustainable energy Developmental session 1: Communicating our way to a net-zero future <ul style="list-style-type: none"> Ideas to action: Communicating net-zero – Dr Jamie Gallagher Transdisciplinary research in a net-zero context – Dr Joanne Leach Using systems thinking to explain complex ideas [PhD session] – Dr Katy Mahoney Communicating the emergency on planet earth – Dr Emily Grossman Developmental session 2: Getting connected to deliver a net-zero future <ul style="list-style-type: none"> My COP26 elevator pitch – Dr Jamie Gallagher New settlements – the challenges of ensuring net-zero development – Alex Pearson Using systems thinking to explain complex ideas [post-doc session] – Dr Katy Mahoney Networking our way to net-zero – Dr Emily Grossman 	2021/2022
2020/2021	
Mock COP26	2020/2021
PhD to Postdoc transition in conjunction with C-DICE	2020/2021
Black Energy Researchers event	2020/2021

Event	Academic year
2020/2021	
Virtual summer showcase Including: <ul style="list-style-type: none"> Virtual poster gallery Images of research Student talks 	2020/2021
EPSRC and Royal Academy of Engineering Postdoctoral Fellowships workshop	2020/2021
ERA Nuffield placements	2020/2021
Moving from ERA PhD to Postdoc – a researcher's perspective	2020/2021
Black Energy Researchers event	2020/2021
2019/2020	
Virtual summer conference, “It’s all about net-zero” Including: <ul style="list-style-type: none"> Guest speakers <ul style="list-style-type: none"> Professor Martin Freer, Director of ERA, University of Birmingham, The Energy Research Accelerator and our Big Ideas for the future Professor Mark Gillott, University of Nottingham, Research in action – The Trent Basin project Professor Zoe Robinson, Keele University, Research in action – The HyDeploy project Katherine Jackson, Technical Director, WSP – The future of energy in the UK Three minute thesis (3MT®) presentations Postdoctoral researcher talks <ul style="list-style-type: none"> Dr Mohamed Sakr Fadel, Thermal performance assessment of the charging/ discharging process of a horizontally oriented shell-and-tube latent heat storage system Dr Richard Sieff, Decentralised Energy Governance in the Global South: The Case of Kenya since the Implementation of Devolution in 2013 Dr Derek Yan, Resilience in the context of nuclear safety engineering Dr Abdelrahman Zaky, Investigating a Coastal Marine Biorefinery Process for the Efficient production of Bioethanol ECR quiz night Panel discussion: Main barriers to achieving net-zero Pub PhD’s Energy 100 Challenge presentations Virtual poster gallery 	2019/2020

Event	Academic year
Energy 100 Challenge	2019/2020
Writing retreat	2019/2200
2018/2019	
All Energy conference, Glasgow: Poster presentations	2018/2019
Trent Basin visit	2018/2019
Pint of Science	2018/2019
Impact and Innovation: Commercialising your research	2018/2019
Personal resilience	2018/2019
Writing retreat	2018/2019
ERA Vision Conference: Poster presentations	2018/2019
ERA Vision Conference: PechaKucha talks	2018/2019
2017/2018	
Energy Trading Event	2017/2018
Personal resilience	2017/2018
2016/2017	
Poster Presentation to MI and ERA	2016/2017
Cohort building and BGS trip	2016/2017
Manufacturing Technology Centre (MTC) and T-ERA	2016/2017

REFERENCES

- i. <https://www.gov.uk/government/news/new-180-million-fund-to-accelerate-energy-research-across-the-midlands-engine>
- ii. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf
- iii. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf
- iv. https://www.midlandsengine.org/wp-content/uploads/2021/11/Ten-Point-Plan-for-Green-Growth-in-the-Midlands-Engine_V1-1.pdf
- v. <https://www.vitae.ac.uk/policy/concordat/full>
- vi. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004824/r_d-pipeline-report.pdf
- vii. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004824/r_d-pipeline-report.pdf
- viii. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/968403/PfG_Final_Web_Accessible_Version.pdf
- ix. <https://www.findauniversity.com/comment/5829/understanding-the-journey-to-doctoral-education-results-from-the-2019-future-phd-student-survey>





CONTACT US

Lennie Foster
ERA and C-DICE Skills Manager
✉ L.A.Foster@lboro.ac.uk

Kathryn North
Head of ERA Skills and C-DICE director
✉ K.North@lboro.ac.uk

era.ac.uk

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