

The Power of 8

Knowledge, Innovation
and Growth for the North





The research that underpins this report was undertaken in the summer of 2015 by Ursula Kelly, Emeritus Professor Iain McNicoll, Deirdre Kelly & James White of Viewforth Consulting Ltd.

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Foreword

The North of England is a vital component of the United Kingdom's economy. Growth of new industries in the North will provide stability and resilience to the regional and national economic future, in a time of change but also of innovation-driven global economic opportunity. The North is home to eight of the UK's top 30 universities. The N8 Research Partnership collaboration brings together the world-class research, innovation and skills of these research-intensive Northern universities.

As detailed in this important new report, the N8 universities are places of extensive student learning and world-class research, yes - but more, they are institutions that anchor the regional economy, through diverse employment and income, and through knowledge exchange and widespread business partnerships and consultancy.

This report quantifies, for the first time, the significant positive impacts that the N8 universities make across the Northern economy. These include benefit to the economy of over £12 billion; driving employment of more people than there are jobs in Salford; training 190,000 students including 17,000 students engaged in research degrees; and holding 32% of all business and public sector consultancy contracts in the UK Higher Education sector.

Moving forwards from this impressive base, the research-intensive universities can play a central role in strengthening and stabilising industries, through new ideas, innovations and insights. As the devolution of important powers to cities and regions moves forward, partnerships between cities and universities can provide a clear voice of leadership and ideas, and can create a high-skill, innovation-driven future. I believe and expect the N8 universities, working individually and together, to be at the forefront of a rejuvenated Northern economy. I look forward to seeing further successful cross-sectoral partnerships with city leaders, and the Northern and national business community.



The Rt Hon the Lord Heseltine CH

Executive Summary

The N8 Research Partnership is the North's regional network of world class research-intensive universities, who come together to combine their strengths in long-term partnership.

This report exemplifies how the N8 institutions, as major economic enterprises, generate revenue and economic activity in the North of England, as well as creating jobs and attracting investment to the region.

N8 universities are outward facing, serving as an integral part of the fabric of their regional business communities. They support and deliver thousands of new collaborative research partnerships with Northern and national businesses. N8 university activities are of vital importance to future innovation-led economic growth of the region. N8 universities deliver for the North:

- > Research income of £1.2 billion p.a. – 88% of all Northern HE research income.
- > Regional economic impact of £12.2 billion p.a.
- > 190,000 students in N8 universities – a highly international population
- > 119,000 FTE jobs due to N8 - equivalent to all the jobs within a Northern city such as Salford.

As this report shows, we play a leading part in establishing new businesses, innovating to grow existing businesses, developing world-class research hubs that support key industrial sectors, and training the next generation of business entrepreneurs and leaders. We hold a strong portfolio of patents, establish

spin outs and start-ups, provide consultancy to businesses and non-commercial organisations, and drive up efficiency through shared computational facilities and enabling business access to our high-value research facilities.

The North is shaped by stark differences in economic and innovation strength across our towns and cities. The regional economy is in great need of better infrastructure, innovation support, and a strategy for long-term economic resilience. The research-intensive universities have a key role to play.

Currently, the university sector is experiencing, and anticipating, highly challenging times - including research funding uncertainty due to potentially severe impact of Brexit on EU research funding, and changes to UK research funding structures. There are also new opportunities emerging through devolution, notably for the North to work collaboratively and to form a coherent voice for research and innovation-led economic strategy.

What would enable innovation in the North to further flourish? N8 proposes an agreed Northern Strategy for Innovation that would make regional collaborations easier and ensure region-wide funding aligned to greatest benefit. We also support streamlined processes and greater funding for SME research collaborations with universities. N8 will seek funding to expand our portfolio of Northern Innovation and Research Communities, growing our existing focus on Urban Transformation and AgriFood Resilience and going beyond these. Finally, N8 encourages development of a pan-Northern, cross-sectoral approach to graduate attraction and retention, enterprise and entrepreneurship.

Professor Koen Lamberts, Chair of N8 Research Partnership and Vice-Chancellor, University of York; and Dr Peter Simpson, Director, N8 Research Partnership

N8 universities
are worth
£12.2 bn
to the North



N8 universities, a major research presence in the North

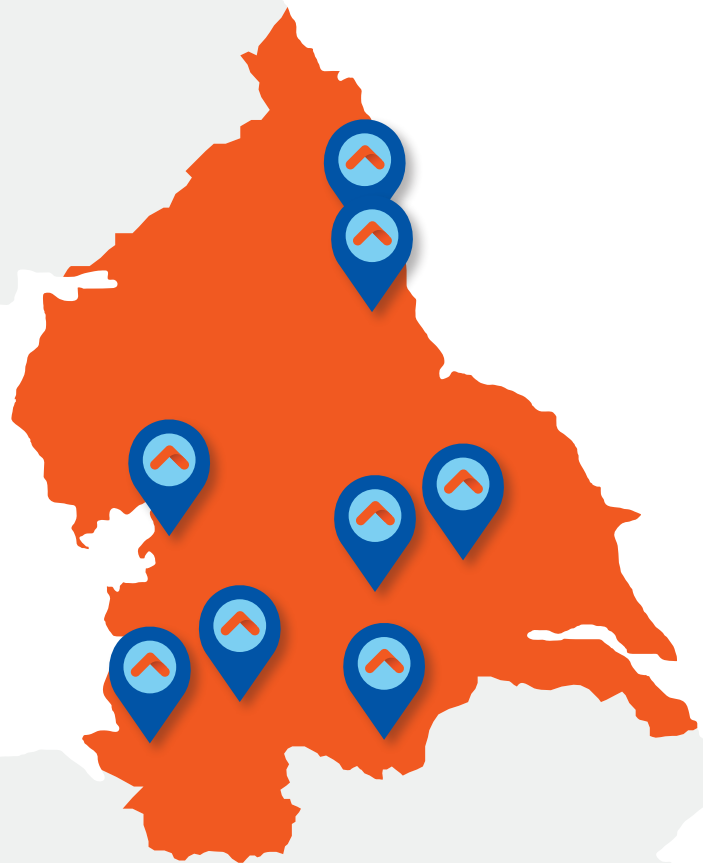
N8 Research Partnership is a not-for-profit collaborative organisation, established and funded by the eight research intensive universities of the North of England - Durham, Lancaster, Leeds, Liverpool, Manchester, Newcastle, Sheffield and York.

This report shows the N8 Research Partnership to be of substantial economic importance to the North of England.

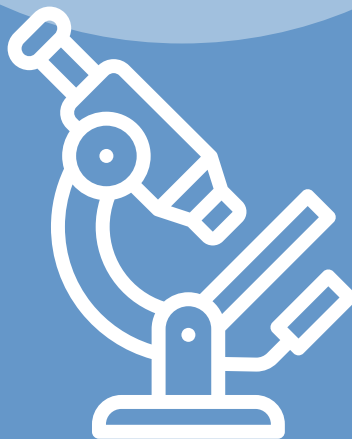
The N8 institutions, as major economic enterprises, generate significant revenue and economic activity in the North of England, as well as creating jobs and attracting investment to the region.

The North has an ongoing need to reinvent its economy to deliver innovation-led growth for a resilient, sustainable future. N8 university activities are of vital importance to the future economic fabric of the region.

N8 universities collaborate with LEPs, cities and businesses across the North. The N8 forms a key platform for future innovation-driven economic success.



N8 universities
attract annual
research income of
£1.26 bn



Economic impact of N8 universities

The N8 universities punch above their weight economically: we deliver into the North a collective income, or turnover, of **£4.1 billion p.a.**; this is **12% of the turnover of the entire UK higher education (HE) sector**, and **59% of the HE sector in the North's turnover (£7.0 billion total)**.

N8 universities are 8 out of 31 Higher Education Institutes (HEIs) in the North of England (26%), and of 163 HEIs in the UK (5%).

As one comparison, N8 universities' turnover is larger than that of all the football clubs of the Premier League, added together.

International income

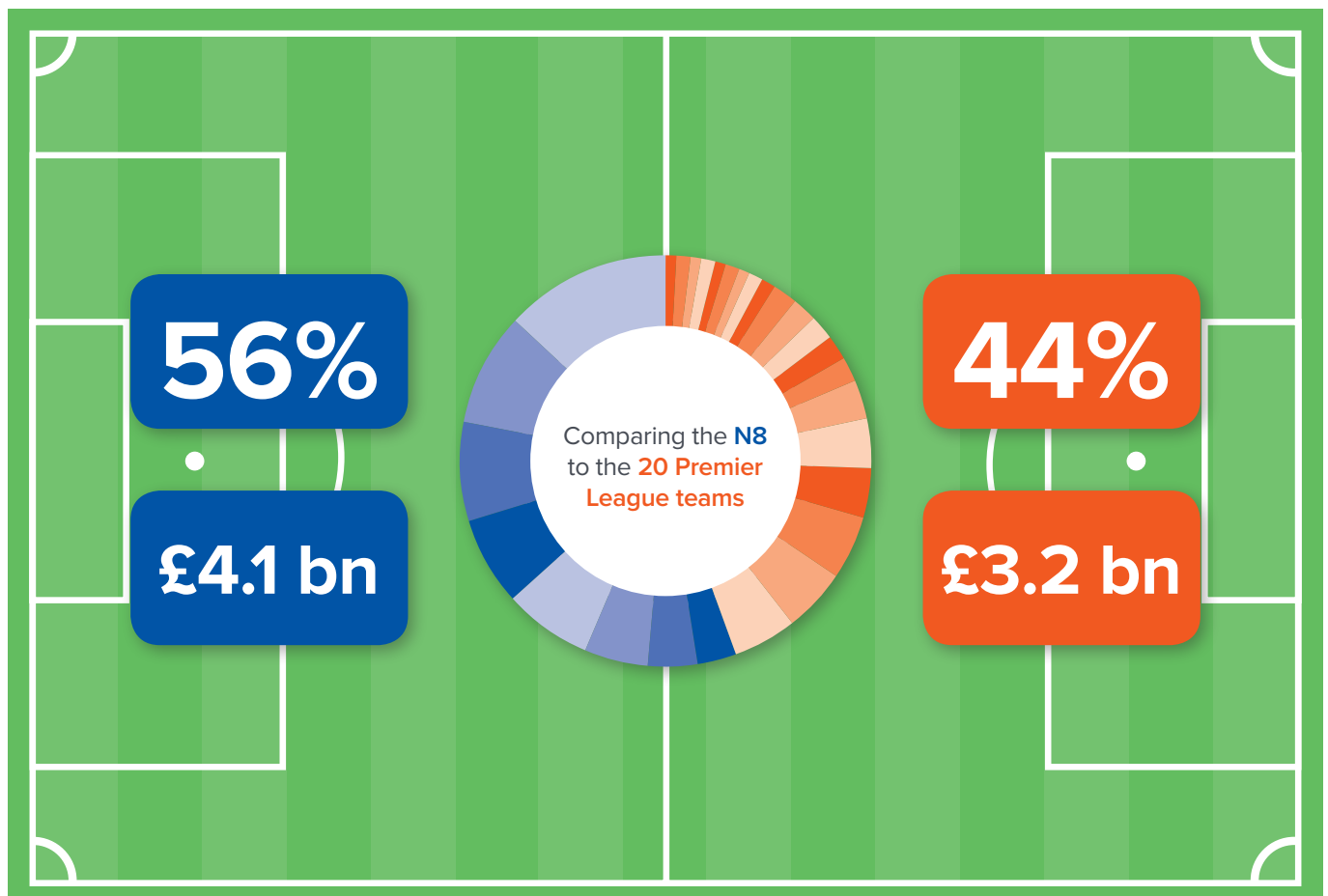
The N8 universities are internationally renowned for quality. Each of the N8 universities is among the top 200 universities in the world, according to the Times Higher World University ranking for 2015-16.

Reflecting this international profile, 26% of N8 university income (£1.06 billion) is from international sources. This includes student fees (non-EU students £714 million and EU students £62 million), together with research grants and contracts (non-EU £32 million and EU £127 million).

When this is combined with the off-campus personal expenditure of N8 international students, a total of over £1.83 billion of export earnings is attributable to the N8 universities.

13.3% of N8 university competitive research income comes from EU sources.

Collective turnover per annum The N8 vs The English Premier League



N8, the Northern Research Powerhouse

In 2014/15 the N8 universities attracted research income of £1.26 billion – made up of £309 million from HEFCE, and £954 million in research grants and contracts from research councils, research charities, industry and other sources.

The £1.26 billion of research income in 2014/15 for N8 universities compares to £173 million in total across the other 23 North of England HEIs. So N8 universities are responsible for winning 88 % of all Northern HE research income.

Competitively-won research income can be seen as a good indicator of universities' research strength. For the N8 universities, research income forms 31% of total income, compared to UK university average of 24%. All N8 universities feature in the UK's top 30 universities for research power (REF 2014).

UK Research Councils

34.3%

UK Local & Health Authorities

20.4%

UK Based Charities

13.5%

R&D Tax Credits

7.5%

UK Industry & Public Corporations

7.1%

EU Government Funding

11.5%

EU Industry & Charities

1.8%

Non EU Industry

1.6%

Non EU Charities

1.7%

Other

0.6%

Creating jobs and opportunities in the North

The N8 universities are a core part of the Northern economic infrastructure - generating significant employment on their campuses and in their local communities.

Delivering jobs

N8 universities directly employ 47,700 staff; which translates into 42,600 full time equivalent (FTE) jobs. This is 12% of all UK HE jobs, and 55% of all North of England HE jobs.

Through 'knock-on' effects - chiefly through the universities buying goods and services from a wide range of suppliers, and through the universities paying wages to their employees, who in turn spend their salaries - N8 universities generate a further 51,700 FTE jobs in other sectors of the economy.

The great majority of these additional jobs (48,400) are generated in the North of England.

In other words, for every 100 direct full time equivalent (FTE) jobs created in the N8 universities, another 121 jobs are generated outside the N8 universities in other industries, 113 of which are in the North.

Adding in the jobs created by student economic activity means that N8 universities support, in addition to their direct employment, 76,400 additional jobs in the North.

N8 university-generated employment is relatively, though not wholly, specialised in high skilled professional and 'white collar' jobs, whilst jobs created in the wider region are spread across a range of types of employment.

Total Northern jobs created by type outside of the universities (including student impact)



Students

N8 universities attract high calibre students from around the world and the rest of the UK, and play a key role in retaining young talent within the North.

There are 190,000 students in N8 universities - 8.4% of the total UK HE student population.

The profile of N8 university students reflects N8 universities' global standing, with 28% being international (5% from the rest of the EU and 23% from non-EU countries). The typical UK HE profile is 81% domestic UK students and 19% international students.

27% of our students are studying for postgraduate qualifications, including 17,000 who are working towards a research qualification.

Our students contribute to the economy of the region through off-campus expenditure, thereby also delivering employment.

Origin	Number	Output	Jobs (FTE)	GVA
North	67,580	£1.18 bn	10,010	£545 m
Rest of UK	69,455	£1.21 bn	10,287	£560 m
Non - EU	43,750	£0.76 bn	6,436	£350 m
EU	9,440	£0.16 bn	1,336	£74 m

Jobs

The N8 universities provide more direct employment than the Electronics industry or Motor Vehicle Manufacturing sector, and a similar level of employment as Media or the Chemicals industry in the North.

Direct jobs per sector compared to N8

The N8 universities 

Chemical Sector



Media Sector



Motor Vehicles Manufacturing Sector



Electronics Sector



Universities creating value, increasing prosperity

The collective N8 universities' output is £4.1bn and our economic activities generate an additional £5.2 billion impact in other industries annually. Of this, the great majority (£4.8 billion) is spent in the region, making a total of £8.9 billion impact in the North. Adding in the regional economic impact of N8 students, the overall impact is £12.2 billion p.a.

The N8 universities' direct "Gross Value Added" (GVA) in 2014/15 was £2.7 billion in the North. GVA is a measure of the net change in wealth or prosperity in the economy due to a company or organisation's activities. Through 'knock-on' effects on the economy, the N8 universities generate a further £2.4 billion of GVA in other industries, making a total of £5.1 billion.

The national impact of N8 universities equates to 0.33% of UK GDP.

Northern GVA

N8 universities direct GVA

£2.7 bn

with 'knock on' effects of

£2.4 bn

and student GVA at

£1.5 bn

...giving a GVA of

£6.6 bn

IN TOTAL

N8 universities contribute a larger share of the **North of England Region GVA** than the entire Northern Media Industry, Agriculture, Electronics or Motor Vehicle manufacturing sectors

The N8 logo, consisting of the letters 'N' and '8' in a stylized white font, is centered within a large orange circle.

N8 strategy

We are the strongest regional collaboration between major universities in the UK. Our role is to:



To deliver these goals, we pioneer pan-Northern collaboration, knowledge exchange and business engagement, to establish innovation communities across industry, public sector and society and translate research into economic benefit.

N8 delivers world-class interdisciplinary research programmes, bringing real world impact to the North of England, and helping to rebalance the UK research excellence landscape.

N8 works to shape regional and national policy to promote the North as an innovative and attractive place to live and work and promotes the capabilities of the North to encourage investment.

World class research with economic impact

N8 has two major research themes which are AgriFood Resilience and Urban & Community Transformation.

AgriFood Resilience

N8 AgriFood Resilience Programme addresses key global challenges in Food Security. These include sustainable food production, resilient food supply chains, improved nutrition and consumer behaviours.

The N8 universities have a track record of excellence in AgriFood research:

- > N8 universities contain the greatest concentration of bioscientists engaged in AgriFood research within the UK.
- > N8's world-class facilities include six fully commercial research farms, with complementary and comprehensive capabilities focussed for cattle, crops, vegetables, and grassland research.

N8 AgriFood has received £16 million in funding to bringing together universities' assets and expertise to deliver a comprehensive AgriFood research platform - ideal for industry partnerships and providing independent assessment on industrial innovations, tested in real-world environments.

“ The N8 partnership is a real step-change in how universities work together, greatly expanding what a single university can achieve. The N8 AgriFood programme provides a single forum for industry to access academic research across these eight northern universities, and will drive the formation of productive partnerships across the public and private sector. ”

Professor Katherine Denby,
University of York and Director of N8 AgriFood

Urban & Community Transformation

The N8 universities are delivering research that will prove essential for ensuring our rapidly changing towns and cities adapt to provide an effective Northern economy and a better society. By studying housing, transportation, causes of inequality, health, sustainability, and other areas, N8 seeks to help transform Northern communities into interconnected, vibrant hubs.

The N8 Policing Research Partnership illustrates the huge potential of this approach. By working with all the police forces and police and crime commissioners in the North, we can identify existing and emerging needs in policing policy. Through this unique programme of research co-production and knowledge sharing we can create solutions informing future policing policy and addressing key issues of public safety.

Other major projects are helping to improve the evidence and policy basis for effective interactions with city partners, offering insights into city planning, urban living, cultural improvement, and ways to engage more effectively with diverse Northern communities. For example, a recent report from N8 highlights learning and expertise in effective Co-Production of practical research with our local communities.

“ We want to transform the relationship between police and academics so that we co-produce the knowledge that will inform and improve the policing strategies of the future. ”

Professor Adam Crawford, University of Leeds and Director of the N8 Policing Research Partnership

Enabling greater innovation in the North

The North's economy is held back by a key gap in the productivity 'toolkit' - innovation. N8 has pioneered the Industry Innovation Forum model to help address this gap. By bringing real-world needs from industry together with academic solutions, and fostering new research relationships, the Forum supports innovation through collaboration. This Innovation Forum model is used widely across N8 projects.

N8 also supports academic-business collaboration through its extensive database of high value research equipment that can be accessed by businesses for collaboration, and by delivering a shared infrastructure in a key research tool, High Performance Computing.

N8's High Performance Computing facility, called N8 HPC, has led to over 90 collaborations between universities and businesses to date, using a range of complex problem-solving and analysis techniques.

N8 HPC is much more than a facility – it is also a centre of excellence for building communities of practice around research challenges and methodologies, providing support and shared training to new and existing users. The scientific impact of N8 HPC has been significant; featured in 84 grant applications totalling £59.8m and its use acknowledged in 377 published research papers to date.

Delivering innovation for industrial success

N8 universities are closely identified with their host cities and play a vital role in supporting and regenerating the regional economy. Whereas other industries may relocate, and government regional policies and industrial strategies may change, the N8 universities remain anchors in their communities - providing a core of economic stability, employment and continuity even as other industries may grow or contract around them.

Innovation - the translation of novel ideas and knowledge into commercial and societal benefit - is at the heart of how we generate economic impact from our research. N8 universities have a strong track record of innovation.

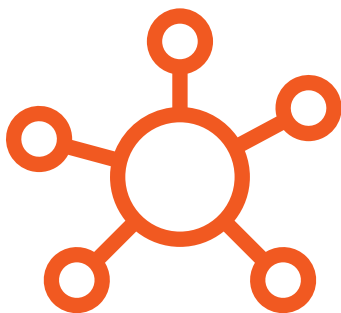
N8 universities convert their world-class research expertise and breakthrough technologies into new and growing businesses.

Since 2010, N8 universities have generated more than 1,000 patents and 230 companies and social enterprises, in addition

to more than 350 student start-ups. Nine of those companies are valued at over £1 million and two listed on the AIM. This pipeline of new companies is vital if we want to grow a Northern economy based on innovation, high-skills and high-growth companies. Promoting and supporting our entrepreneurs, researchers and students to develop and grow their ideas brings economic benefit across the region, for example:

- > Durham University established Kromek, listed on the AIM, that has created over 100 jobs in the UK and at two sites in the US, and Applied Graphene Materials has created over 40 high-tech jobs in the North East.
- > Lancaster University developed a novel process for application of jasmonates to crop seeds rather than leaves. Following licensing to BASF and further development of the technology it is now used globally. For example, in the US for soybean crops, it has been used on over 2.5 million hectares of fields resulting in an increased yield and value at the farm gate of approximately \$60 million p.a.

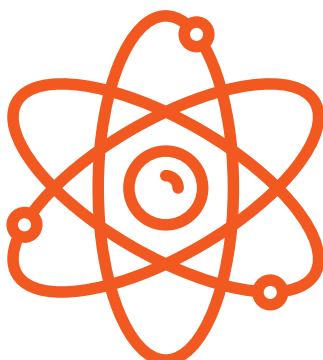
N8 universities contribute to the Northern innovation economy by:



Creating new businesses



Innovating to grow existing businesses



Establishing research hubs that support key industrial sectors



Developing the next generation of business entrepreneurs

N8 Universities help existing businesses through research partnerships and consultancy with industry – delivering ideas and insights, and co-producing research. We held 5,608 research contracts with business and non-commercial organisations (17% of UK total) in 2014.

Reflecting the particularly high priority we place on knowledge exchange, N8 universities undertook 32% of all UK HE consultancies with business and non-commercial organisations (in total, 31,104 contracts) in the UK in 2014/15.

This is not limited to large multinational organisations, as 17,389 of these relationships were with small and medium-sized businesses (SMEs).

For example:

- > University of Manchester worked with Perceptive Engineering to develop a 'next generation' industrial control package affording the opportunity for engaging its existing products in several new industrial sectors, resulting in sales turnover increasing by over £400k and employment of three new staff.
- > In response to BOCM Pauls' need to enhance staff development, University of Liverpool's Veterinary School devised two highly participative training courses. Through access to cutting-edge research and interaction with consumers of their products in a learning environment the programme led to an increase in sales of 80%.

N8 universities also partner with not-for-profit organisations, public sector, and charities. We hold 12,411 consultancy contracts with non-commercial organisations - a remarkable 45% of all such non-commercial organisation consultancy in the UK.

EU Structural Funding schemes are, currently, helping to support Northern universities to engage with companies to provide services and expertise. Currently N8 universities have 32 schemes supporting engagement with over 4,300 businesses.



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12,411

consultancy contracts with non-commercial organisations

45%

of all such non-commercial organisation consultancy in the UK

The tools and skills that the Northern economy needs

N8 universities have developed Research Hubs - regional or national centres of excellence that provide a focal point in specific priority areas for industrial innovation. For example:

- > University of Sheffield hosts the Advanced Manufacturing Research Centre, a world-class centre for research and innovation into advanced manufacturing technologies. This centre has over 80 industrial partners, and helps over 400 people from the age of 16, including apprentices, with support through to higher-level qualifications.
- > Biovale, conceived by the University of York, is a bioeconomy innovation cluster that builds on world-class strengths in renewable raw materials and agri-tech. The University's Biorenewables Development Centre, as a key member of Biovale, has developed more than 200 collaborative projects with SMEs in the last 3 years.

over
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Innovative businesses need great business leadership. N8 universities play an important role in skills training, particularly in enterprise and entrepreneurship. For example:

- > Rise Up, at Newcastle University provides entrepreneurial support. In 2014/15 nearly 2,500 students participated and the University assisted with the creation of 35 student or graduate-led ventures. Two of these have won prestigious national awards. £2.1 million in external funding was secured by graduate led ventures during 2015.
- > Spark, at the University of Leeds, supports student enterprise with business advice, grants and funding, modules and mentoring. Spark workshops, modules, and annual enterprise boot camp were attended by around 1,200 students 2015; 48 companies were launched by students that year alone.

in 2015
£2.1m
external funding secured by
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in 2015
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were launched
by students
from this work

N8 universities contribute to the Northern innovation economy in many ways; establishing new businesses, innovating to grow existing businesses, developing hubs in key industrial sectors, and developing the next generation of entrepreneurs. However, the regional and national economy remains in need of innovation-led growth, and long-term resilience. The universities have a key role to play. What would enable innovation in the North to flourish?

> An agreed Northern Strategy for Innovation.

This would make regional collaborations easier and ensure funds align to greatest opportunity and benefit. As a first step, N8 proposes the establishment of a Northern Innovation Forum bringing together the key players - including Innovate UK, LEPs, Government, and N8 - to agree a coordinated strategy for supporting Northern Innovation.

> The North needs streamlined processes and greater funding for ensuring ease of SME interaction with research-intensive universities.

The vast majority of businesses in the region are SMEs and include many high growth businesses. A business-focussed Northern Innovation Fund, that SMEs could access to partner with multinationals and universities, could deliver major impact.

> N8 should seek to build further cross-sectoral Innovation Communities.

By supporting companies and research institutes to promote growth in areas of identified region-wide strengths, N8 will seek to gain national government or research council funding for pan-Northern innovation 'hotspots' and collaboration programmes, and for flagship centres such as Catapults.

> Development of a pan-Northern, cross-sectoral approach to skills for economic growth.

This could increase graduate attraction and retention, and could promote enterprise and entrepreneurship within the wider community. City leaders, LEPs, local and national government, and universities, would need to develop a coordinated vision.



Since 2010, N8 universities have
generated more than:



1000

Patents

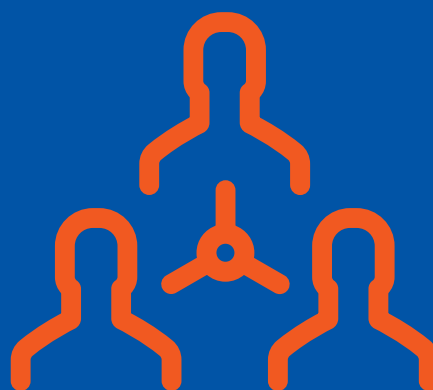
350

Student start - ups



230

Companies and
social enterprises



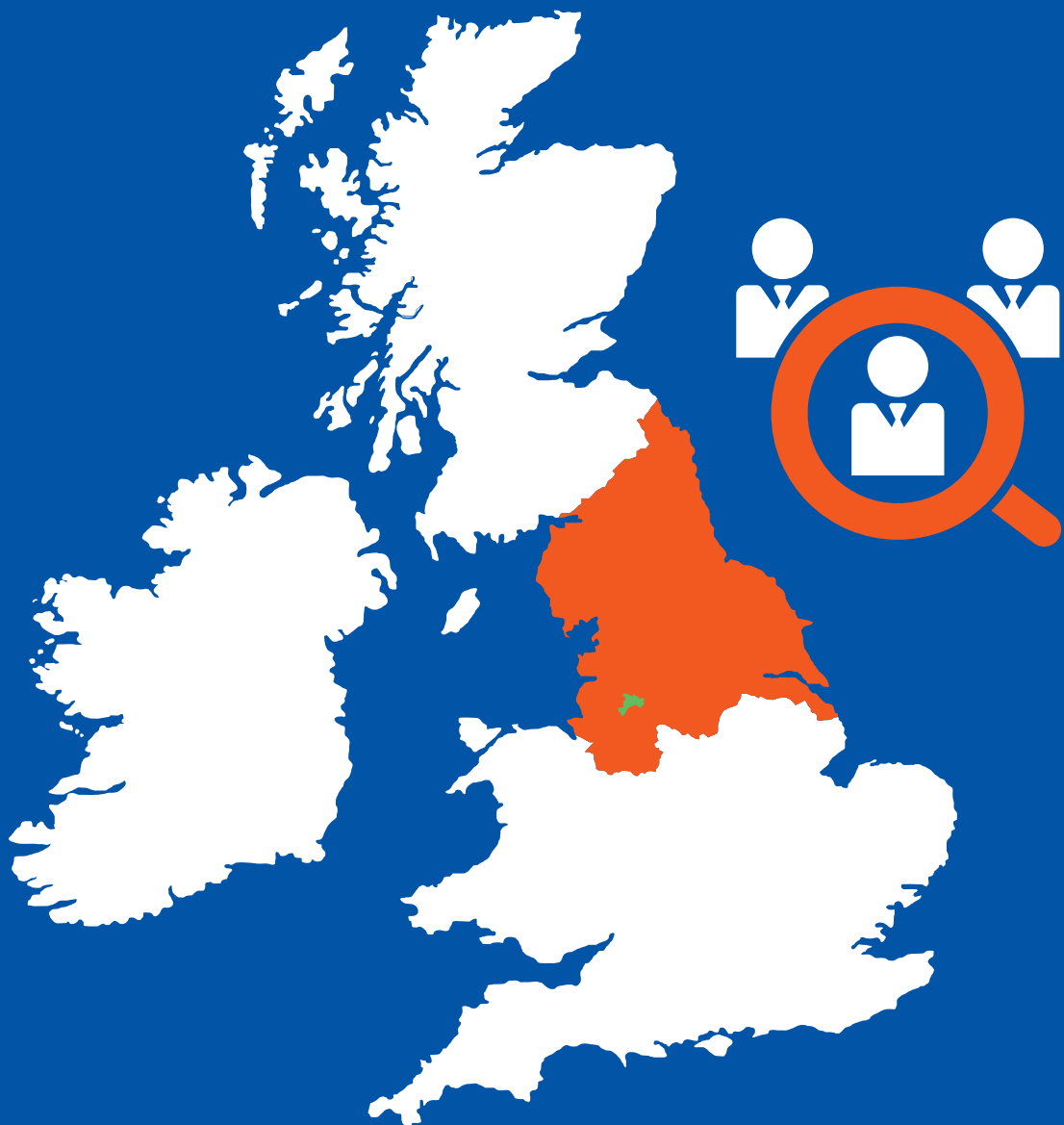
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Northern employment generated
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Cutting the cost of producing aircraft components



The
University
Of
Sheffield.

Case Study: Industrial Innovation

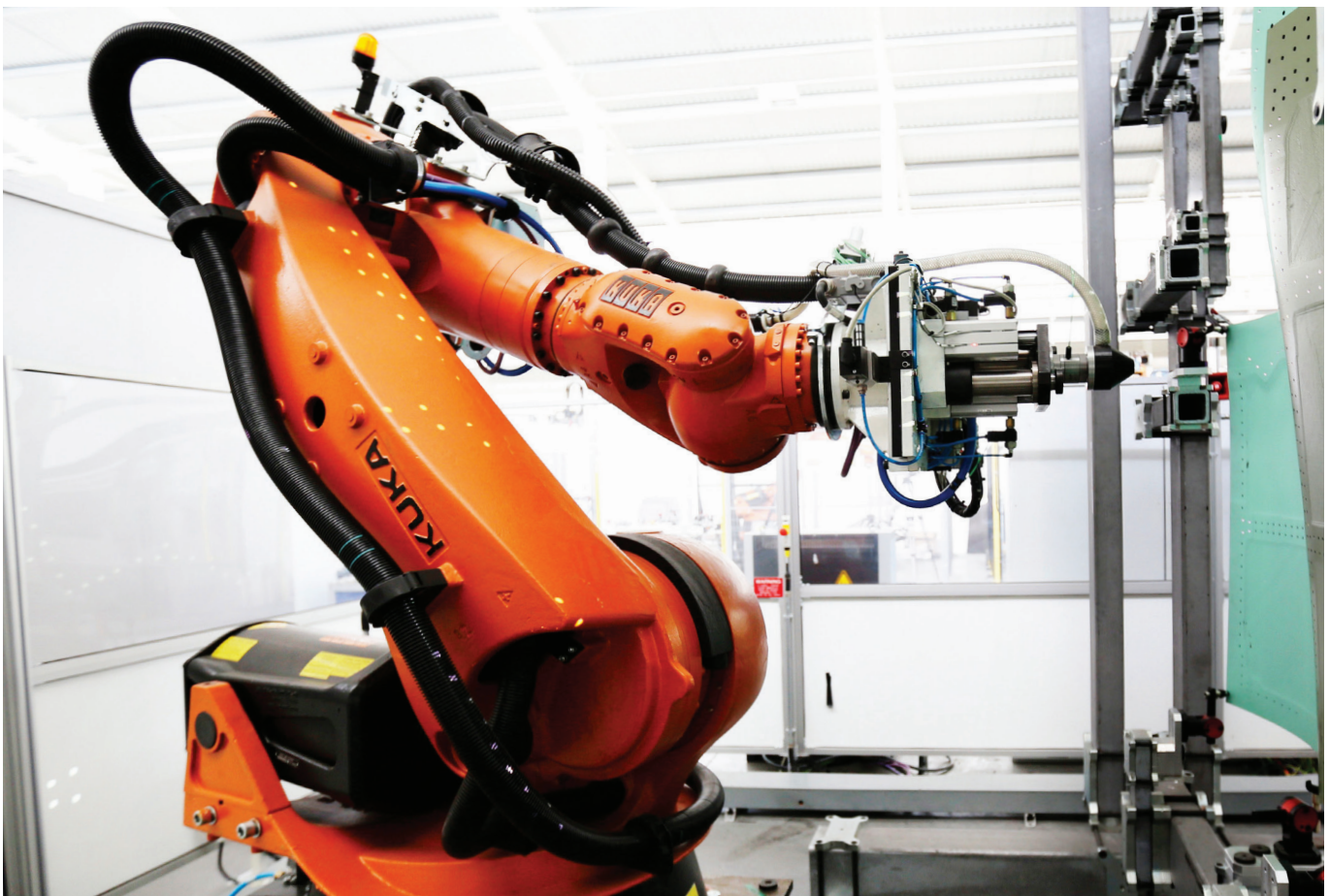
A research project to enable robots to accurately machine holes in composite aircraft components, has matured into a production system which is on track to save BAE Systems millions of pounds in capital and operational costs over the coming years.

The Robotic Countersinking technology was developed through collaborative research, led by the University of Sheffield's Advanced Manufacturing Research Centre (AMRC) and involving Kuka Systems UK. The production system has now been installed at BAE Systems in the UK, where it will be used to process composite components for aircraft.

The Robotic Countersinking technology involves the use of multiple robots to automatically handle composite components and then countersink predrilled fastener holes. The system includes the use of Augmented Reality to aid component fixturing.

Austin Cook, from BAE Systems, said: "Since we began working with the AMRC in 2006 it has supported the development of key manufacturing technologies ranging from high performance titanium machining to advanced automation for components. The AMRC has helped us mature the Robotic Countersinking technology from technology concept to full scale production demonstrator, derisking along the way, and helping to catapult the capability into our business."

“ The AMRC has helped us mature the Robotic Countersinking technology from technology concept to full scale production demonstrator ”



Innovating with SMEs

Case Study: Helping small businesses to grow

The Centre for Global Eco-Innovation was created to help increase levels of innovation in Small and Medium Enterprises (SMEs). The centre unites the expertise, resources and global contacts of N8 members Lancaster University and the University of Liverpool, as well as commercialisation company Inventya Limited, with businesses wanting to grow and innovate. The goal is to develop for the global marketplace, new products, processes and services which deliver positive environmental impacts.

The centre calls upon a range of academic expertise working closely with project supervisors within the partner businesses. For the majority of these partner SMEs, this represents the most significant commitment to collaborative research with a university they have undertaken to date.

The centre has already engaged with 300 businesses, 135 SMEs have been supported with mentoring, 260 jobs have been created and £4.9 million investment has been secured for the region.

In addition, the centre has helped to protect our environment with savings of: 27,000 tonnes of greenhouse gas emissions; 46,000 tonnes of water; 19,000 tonnes of materials; and 55,000 tonnes diverted from landfill.

“ This represents the most significant commitment to collaborative research with a university the SMEs have undertaken ”

Created

260

jobs in SMEs

£4.9m

investment secured
for the region



High-value chemicals from household waste

UNIVERSITY of York

Case Study: AgriFood Resilience

Over 50 million tonnes of organic waste are produced each year from homes and businesses. Developing effective systems to turn this waste into useful products, such as high-value chemicals and biofuels, is a challenge that Wilson Bio-Chemical is tackling with researchers at University of York.

Building on Wilson Bio-Chemical's expertise in the initial breakdown of biogenic materials, researchers at the University of York have collaborated with them on:

- > Honing the autoclaving process and optimising enzymes for fermentation
- > A new pilot-scale autoclave that demonstrates the potential of organic fibre as a fuel substitute, as well as produces biobutanol, ethanol, acetone and hydrogen
- > Multidisciplinary studentships working across the industry-academic interface

This work has the potential to make a substantial impact on environmental sustainability - by not only diverting, and recycling, waste from landfill, but reducing reliance on fossil fuels and their associated carbon emissions.

“ This work has the potential to make a substantial impact on environmental sustainability ”



Crop growth – whatever the weather



UNIVERSITY OF LEEDS

Case Study: AgriFood Resilience

Changes in the global climate mean that we have to continuously adapt and evolve the crops and plants that we grow to feed the population. Researchers at the Universities of Leeds, Sheffield and York are working on developing more resilient strains of crops that are grown in the UK and around the world.

At the University of Leeds' dedicated research farm, the academic scientists are working to understand how different combinations of crop varieties, cultivation practices, and ways of encouraging biodiversity, can increase the crops' ability to grow despite potential waterlogging, disease, or droughts.

Through collaboration with partners in China researchers are also developing new nano-sensors to report on the experiments as well as better methods for easily sharing data across continents.

In addition to delivering more resilient crops, the research will provide insights into better approaches to land management. This work is already influencing the development of new policies for sustainable agriculture, nationally and globally.

“ In addition to delivering more resilient crops, the research will provide insights into better approaches to land management ”



The Materials Innovation Factory



UNIVERSITY OF
LIVERPOOL

Case Study: Industrial Innovation

Advanced materials are vital to the future prosperity of the UK economy. Sustainability of materials supply is crucial, as global stocks of fossil fuels and other feedstocks dwindle, and novel materials are needed to drive applied technological innovation.

The Materials Innovation Factory, a £68 million public / private investment, will bring together one of the largest research-active companies in the UK, Unilever, with one of the strongest chemistry departments in the UK, at the University of Liverpool, to address key challenges in materials science.

The facility is the largest R&D investment Unilever has made with any university globally and the largest industry-academic collaboration in chemistry within the UK. This is a landmark example of leading anchor institutions and major employers, collaborating around a shared expertise for economic benefit.

By design, the new facility will promote exchange of ideas and knowledge - co-locating up to 300 industry and academic researchers. The Materials Innovation Factory will deliver major improvements in scientific productivity, and reduce new product development times, to drive economic growth and international research competitiveness.

“ The facility is the largest R&D investment Unilever has made with any university globally ”

Supports over

60

technology driven SMEs

£68m

Public / Private
investment supported
by HEFCE



Super-repellent surfaces

Case Study: Industrial Innovation

Durham University researchers have developed a process for treating surfaces with an electrical discharge (plasma) that has led to a wide variety of applications - from waterproofing of hiking boots and hearing aids, to enabling mobile phones to continue working after being dropped into the bath.

The industrial challenge was to develop a technique that created ultrathin, super-repellent surfaces for a variety of materials on a commercial scale - in a single step, without use of solvents and using low energy consumption.

Researchers at Durham University developed surface treatment techniques that use very low amounts of material in order to minimise environmental impact, resulting in a quick, single step process that is both cheap and low energy.

“ This discovery has been directly converted into a now widely-used industrial coating process ”

The discovery has been directly converted into a now widely-used industrial coating process through three valuable start-up companies (Surface Innovations Ltd, Dow Corning Plasma Solution Ltd and P2i Ltd).

P2i Ltd was spun-out from a project addressing the challenge of making soldiers' protective clothing more effective whilst maintaining comfort in hot and dehydrating conditions. P2i Ltd have further commercialised the research, raising over £40 million in investment - resulting in the waterproofing of over 100 million mobile phones, 3 million pairs of footwear, and 75% of the world's hearing aids.



Innovative technologies and national research centres



Newcastle University

Case Study: Urban and Community Transformation

Science Central is Newcastle's £350 million flagship project bringing together academia, the public sector, communities, business and industry. A partnership between Newcastle University and Newcastle City Council, the 24-acre site has been at Newcastle's industrial heart for 200 years - originally as a colliery, and later the production centre for Newcastle Brown Ale.

Science Central is attracting key industry partners including Siemens, Red Hat, Microsoft, Northern Powergrid and Northumbrian Water. Legal & General Capital praised the partners' vision for urban innovation and announced a £100 million investment in the site to create 200,000 sq. ft. of Grade

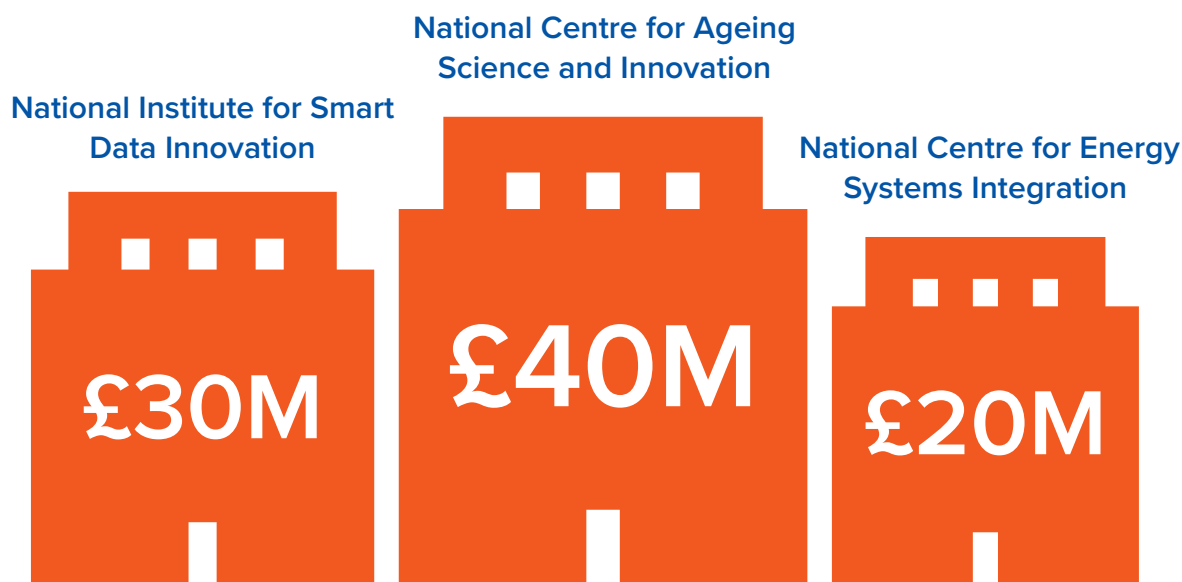
A office space and up to 2,000 jobs. The landmark building The Core opened in November 2014 and is full to capacity, while Newcastle University delivered the first research labs in The Key which opened in February 2016.

Science Central will trial innovative technologies that will benefit not just the region but society as a whole. It will house three national research centres - the £20 million National Centre for Energy Systems Integration, the £40 million National Centre for Ageing Science and Innovation and the £30 million National Institute for Smart Data Innovation.

Also, Newcastle University's £58 million Urban Sciences Building on the site will open in 2017, housing world-class computing science, and an urban observatory - where real time data will be analysed to improve our understanding of the urban interactions between energy, water, transport, waste and digital control systems.

“ Science Central will trial innovative technologies that will benefit not just the region but society as a whole ”

Investment in new national research centres



Enthusing the next generation about science

MANCHESTER
1824

The University of Manchester

Case Study: Public Benefit

From music festivals and the BBC Stargazing Live series to schools outreach, Jodrell Bank shares the excitement of science with the public.

Following the 2011 launch of its new £2.9 million Discovery Centre, the Observatory now attracts 160,000 visitors, including over 20,000 school children, each year. This public engagement programme has created over 30 new jobs and has brought £8 million into the local economy.

The Discovery Centre's exhibits cover many aspects of astronomy and physics, including work undertaken by University of Manchester researchers working within Jodrell Bank. The popular 'Meet an Astronomer' sessions inspire children – the next generation of scientists – while adult audiences are attracted to sell-out public lectures.

The science performed on site itself has a major economic impact, and not just in the UK. The Observatory has been a world-leader in radio astronomy for more than 70 years and has recently been chosen to host the international headquarters of the Square Kilometre Array – which will be the world's largest telescope.

Outside of education, Jodrell Bank organises award-winning festivals which reach out to new audiences. In 2016 the Centre launched Bluedot - a weekend festival featuring music, science, arts and technology which was attended by 15,000 people.

Media engagement contributes to the high public perception of Jodrell Bank - an online survey showed that 54% of the UK population is aware of the science facility.

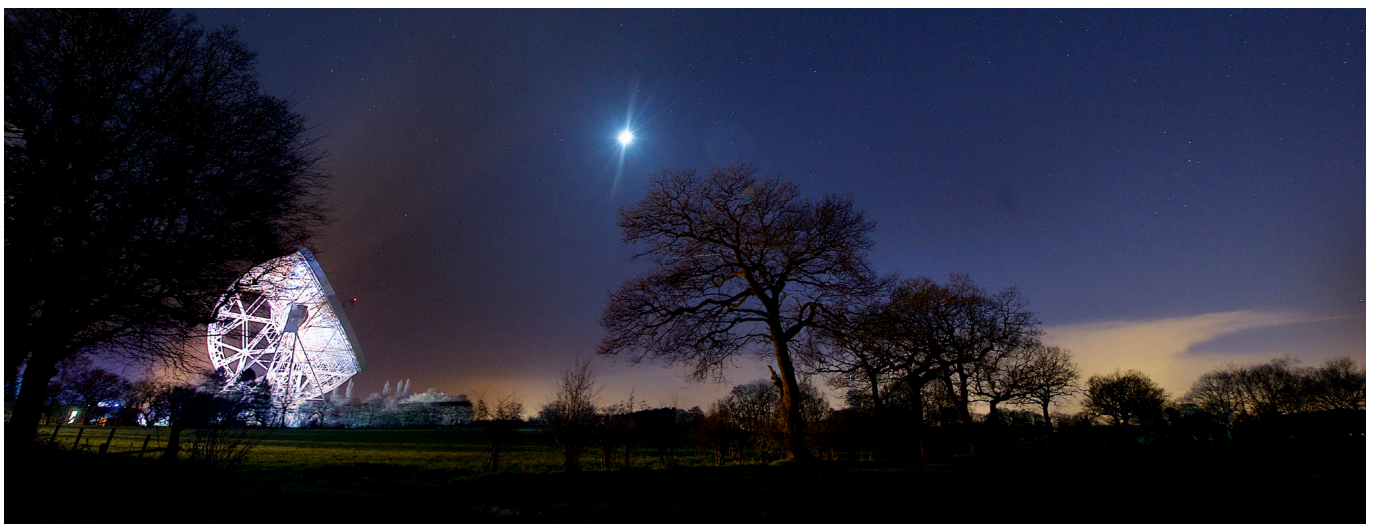
The site is now shortlisted for UNESCO World Heritage Site status as 'a major modern scientific development which has greatly enlarged human understanding of the Universe'.

“ The popular 'Meet an Astronomer' sessions inspire children – the next generation of scientists ”

Jodrell Bank brought

£8m

to the local economy



**N8 universities and
students** contribute

£6.6 bn

to the GVA
of the North

that is

2.2%

of total North
of England GVA



RESEARCH
PARTNERSHIP

The background of the image is a deep blue monochrome photograph. It features several wind turbines in the upper half, their blades extending across the frame. In the lower half, there is a close-up, low-angle view of solar panels, showing the grid-like pattern of the photovoltaic cells. The overall composition suggests a focus on renewable energy and sustainable technology.

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