



# OXFORDSHIRE FOR ENERGY

Choosing to invest in the UK's energy development heartland



An aerial photograph of a university campus. In the foreground, there is a residential area with many small, brick houses. To the right, a large, circular stadium with a white roof is prominent. The campus is filled with various buildings, parking lots, and green spaces. The background shows a mix of green fields and trees under a cloudy sky. The text "WHERE MULTIDISCIPLINARY COLLABORATION STIMULATES INNOVATION" is overlaid in white, bold, sans-serif font, framed by a thick orange border.

**WHERE MULTIDISCIPLINARY  
COLLABORATION  
STIMULATES INNOVATION**



# WHY OXFORDSHIRE?

Oxfordshire has thriving clusters in energy and energy storage solutions, where multidisciplinary collaboration stimulates innovation.

Our region has the key ingredients that make up a world-class innovation ecosystem:

- a flourishing environment for innovation and business creation
- world-leading experts in knowledge and technology development
- a dynamic, agile, and skilled workforce.



## GLOBAL HUB FOR ENERGY INVESTORS

With an established track record of attracting investment from around the world, Oxfordshire has received £2bn in foreign direct investment since 2015.

Foreign-backed energy solutions companies which have expanded or established operations in Oxfordshire during the last three years include [Oxis Energy](#), [Nexeon](#), [Tokamak Energy](#), [General Fusion](#) and [First Light Fusion](#).

Energy solutions will play a major part in making Oxfordshire one of the world's top three innovation ecosystems by 2040 – the vision for OxLEP's [Local Industrial Strategy](#).

# ACADEMIC RESEARCH

Home to two universities, the [University of Oxford](#) and [Oxford Brookes University](#), our region has unrivalled centres of academic research into alternative energy sources, energy storage solutions and many related disciplines and applications.

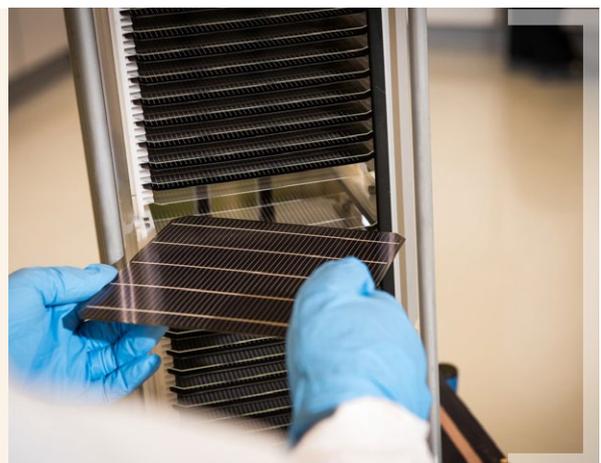
The University of Oxford has several leading institutions noted for their research, facilities and industry collaborations:

- [Oxford Energy](#) is a hub for co-ordinating and collaborating energy research across a range of departments including, among others, engineering, mathematics, computer science and the work of the [Oxford Institute for Energy Studies](#), the [Oxford e-Research Centre](#), the [Oxford Martin School](#) and the [Smith School of Enterprise and the Environment](#). It carries out world-leading research on a wide range of energy-related themes including bioenergy; demand and efficiency; energy policy, economics and law; electricity networks, energy in developing countries, nuclear, solar and energy storage.
- The [Oxford Thermofluids Institute](#) houses the most sophisticated turbine and high-speed flow facilities in the UK. It researches into gas turbine, hypersonics, and energy and environment. Its facilities support development of systems that are widely deployed in industry.
- The [Oxford Materials Characterisation Service](#) offers a comprehensive service for the investigation of materials and materials related problems, applying its expert knowledge and extensive facilities across many different industry sectors as well as offering training.

The [Oxford Institute for Sustainable Development](#) at Oxford Brookes University is one of the UK's largest research institutes dedicated to sustainable development research in the built and natural environments. Energy research is one of its eight distinct research groups.

## Successful spin-outs

[Oxford University Innovation](#) has spun out 100 companies since 1997, including [PowerMarket](#) and [First Light Fusion](#). Research currently being carried out by the University of Oxford includes the development and commercialisation of novel perovskite materials by [Oxford Photovoltaics](#) and the use of green ammonia as an energy storage solution.



# WORLD-LEADING FACILITIES

Oxfordshire has long been home to some of the most significant developments in energy research.

More than 6,000 people work in [Harwell Campus](#)'s vibrant, fast-growing community of research councils, start-ups and multinational organisations. The site hosts over 225 research and technology companies in a wide range of disciplines and internationally-renowned assets. Harwell's [EnergyTec Cluster](#) has 57 dynamic companies and 1,100 people actively researching electrochemical energy storage, many working collaboratively with the site's [Space](#) and [HealthTec Clusters](#). The [Faraday Institution](#) is a key stakeholder, linking 20 universities and 30 industry partners. Other national assets at Harwell include the [Diamond Light Source](#), the [Rosalind Franklin Institute](#), [UK Space Agency](#), [European Space Agency](#) and [Rutherford Appleton Laboratory](#).

The [Science & Technology Facilities Council](#) at Harwell works collaboratively with experts and a range of businesses across a broad range of sectors, enabling them to exploit world-class science facilities such as the Diamond Light Source, to

overcome difficult product, manufacturing or process issues. It helps companies to develop new products, accelerate product discovery, and improve processes and products.

[Culham Science Centre](#) is home to [UKAEA](#) (the United Kingdom Atomic Energy Authority) and the [Culham Centre for Fusion Energy](#), the UK's national fusion energy laboratory. UKAEA operates the [Joint European Torus \(JET\)](#) – the world's largest and most powerful tokamak – on behalf of its European partners, and the [Mega Amp Spherical Tokamak \(MAST\)](#) Upgrade device. (see page 10). The [Materials Research Facility](#), which enables industrial and academic researchers to analyse the effects of irradiation on materials, is also located at Culham, offering affordable, convenient access for users from fission, fusion and other research programmes – bridging the gap between university and nuclear licensed site laboratories.

The UK government will invest £184m by 2025 in new fusion facilities, infrastructure and apprenticeships at the Culham Science Centre.

*The Faraday Institution, Harwell.*



# A PLACE TO GROW

## OXFORDSHIRE'S INNOVATION CENTRES

**Harwell Campus** houses 225 research and technology companies in health sciences, med tech, space applications and energy. The site houses one of Europe's largest space clusters of over 100 fast-growing companies. Critical assets include the [Diamond Light Source](#), the [Rosalind Franklin Institute](#), [Faraday Institution](#), [UK Space Agency](#), [European Space Agency](#), and [Rutherford Appleton Laboratory](#), and [VMIC](#), the UK's first dedicated Vaccines Manufacturing and Innovation Centre.

**Culham Science Centre** hosts over 2,000 scientists carrying out world-leading research into areas such as fusion power and autonomous vehicles. Critical assets include the [Culham Centre for Fusion Energy](#), which will design and build the world's first compact fusion reactor by 2040, [RACE](#) (Remote Applications in Challenging Environments), and the [Culham Innovation Centre](#).

The **Bicester Motion Innovation Quarter** will establish a world-leading automotive engineering centre of excellence and offer new accommodation for international technology businesses.

**Heyford Park** provides a range of commercial accommodation warehousing, workshops, lab space and offices and is already home to over 100 businesses.

University of Oxford's **Begbroke Science Park** focuses on advanced engineering and medical tech for 35+ world-leading research & technology companies. By 2032, a £2bn programme will co-locate engineering, physical and life sciences research to Begbroke's global innovation campus, to work directly with industry.

Within the **Oxford City Science Area**, key development work is ongoing in sectors such as life sciences, digital health, AI technologies and quantum computing. Key assets include the [Oxford Centre for Applied Superconductivity](#).

The **Oxford Science Park** is home to more than 100 companies, from start-ups to multinationals, working within a vibrant R&D and commercial community. It offers a variety of design-and-build office and laboratory accommodation.

**Milton Park** is a science and technology park home to 250 companies and 9,000 people and forms one of the largest science clusters in the UK. It is part of a trial to introduce autonomous vehicles in the area.

**Oxford Technology Park** is a new science and technology park that offers flexible office and R&D space to the north of Oxford. The site is located adjacent to [London Oxford Airport](#) and with [nearby access](#) to London by rail.

**Oxford Business Park** is an innovation based community and home to [Oxbotica](#). It is close to the city centre and hosts over 60 science, technology and service companies. It offers workspace to suit all sizes of businesses and an amenity rich environment.

**Howbery Park** is the UK's first solar powered business park. It provides a range of sustainable office space for science and technology businesses set within parkland on the banks of the River Thames.

**Grove Business Park** offers office, R&D and industrial buildings, strategically located between the M4 and the A34 roads.

**The Quadrant** Abingdon Science Park is situated near Abingdon's historic town centre and offers office and laboratory accommodation.

# INNOVATION CLUSTERS ACROSS OXFORDSHIRE

Western Europe's highest  
concentration of science  
research facilities



# BACKING THRIVING ENERGY BUSINESSES

## ENERGY STORAGE AND BATTERY APPLICATIONS

[Oxis Energy](#), based at Culham Science Centre, is leading the world in the development of lithium sulphur chemistry and has plans to revolutionise the rechargeable battery market. Focusing on the aviation, defence and heavy vehicles markets, it has attracted £24m of international funding from companies including Aerotec Brazil, Sasol South Africa, French aerospace group Safran and chemicals company Arkema.

[Nexeon](#), based in Milton Park, is a world leader in engineered silicon materials for battery applications. Its Li-ion battery anode technology uses silicon instead of graphite, and enables a dramatic improvement in the performance of EV rechargeable battery technology. It has raised £30m and has offices in Oxford and Yokohama, Japan.

[Brill Power](#) is developing intelligent battery management and control technology to increase the lifetime, safety and sustainability of lithium-ion battery packs for stationary energy storage and electric vehicles. The University of Oxford spin-out raised £2.5m in early 2021, from a mix of £1.1m public sector support and an over-subscribed £1.4m seed round.

Global sustainable technology company [Johnson Matthey](#) chose Oxfordshire for its battery application centre. At the newly-built office and laboratory development in Milton Park, its product development team is collaborating with automotive customers to develop next generation battery materials to give electric cars greater range and faster recharging, while minimising the use of scarce raw materials.

## HYDROGEN

Hydrogen has the potential to play an important role in meeting net-zero targets. It offers many considerations and challenges in its production, transportation and storage.

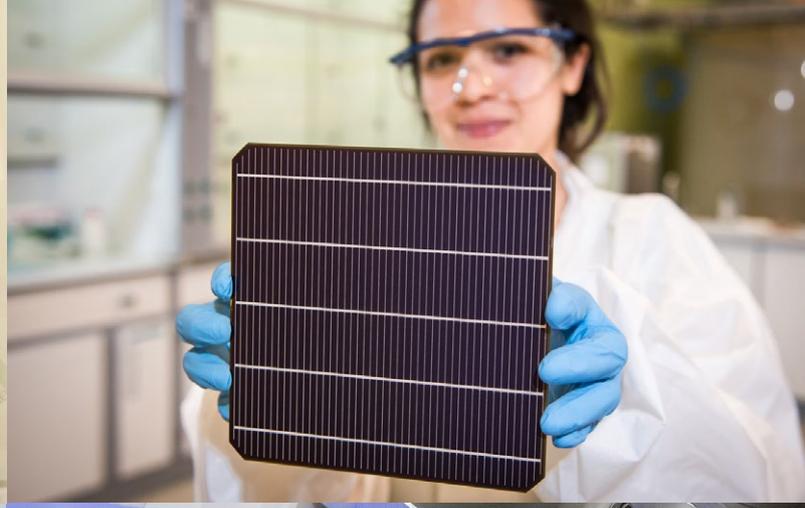
The Green Ammonia Demonstrator at the [Rutherford Appleton Laboratory](#) brings together all the technologies required to demonstrate the complete ammonia energy cycle. The project is helping to better understand the potential of ammonia for the rapid deployment of a bulk, carbon-free hydrogen network. Created in partnership with the Science and Technology Facilities Council, the University of Oxford, Cardiff University and Siemens, the system uses water electrolysis to provide a hydrogen supply and extracts nitrogen from the air.

[Siemens](#) selected Harwell for its £1.5m proof-of-concept plant that is testing the use of ammonia as a way to store and transport hydrogen in energy systems.

## SOLAR ENERGY

[PowerMarket](#) is a deep-learning mapping and monitoring technology which leverages satellite data to identify ideal solar sites and forecast generation for grid management. Incubated through Oxford University Innovation, it received initial grant funding from the European Space Agency, and seed funding from Seraphim Space Camp and Techstars. In August 2020 it received six-figure funding from venture capital company QVentures.

[Oxford Photovoltaics](#)' revolutionary perovskite solar cell could lead to 30% more efficient mass-produced energy. Its low cost, highly efficient photovoltaic technology integrates with standard silicon solar cells to dramatically improve their performance. Named as one of the top 50 most [innovative](#) companies in the world, it has received nearly \$140m in funding from a range of institutions including German solar specialist Meyer Burger and Chinese wind turbine maker Goldwind.



## WIND ENERGY

There is an active wind energy R&D community within the UK, centrally supported by the The Engineering and Physical Sciences Research Council (EPSRC) and Innovate UK. The [University of Oxford](#) runs the EPSRC Centre for Doctoral Training (CDT) in Wind and Marine Energy Systems and Structures in collaboration with the universities of Strathclyde and Edinburgh. The [Oxford Martin School](#) brings together researchers on energy issues to conduct interdisciplinary studies on the technical, market, social, and policy challenges for integrating renewables.

[TCI Renewables](#), with headquarters in Oxford, develops, constructs and operates wind energy projects across the UK and North America.

[Sygensys technology](#) helps maintain grid stability during time of rapid change in supply or demand for both wind and solar energy.

## NURTURING GROWTH

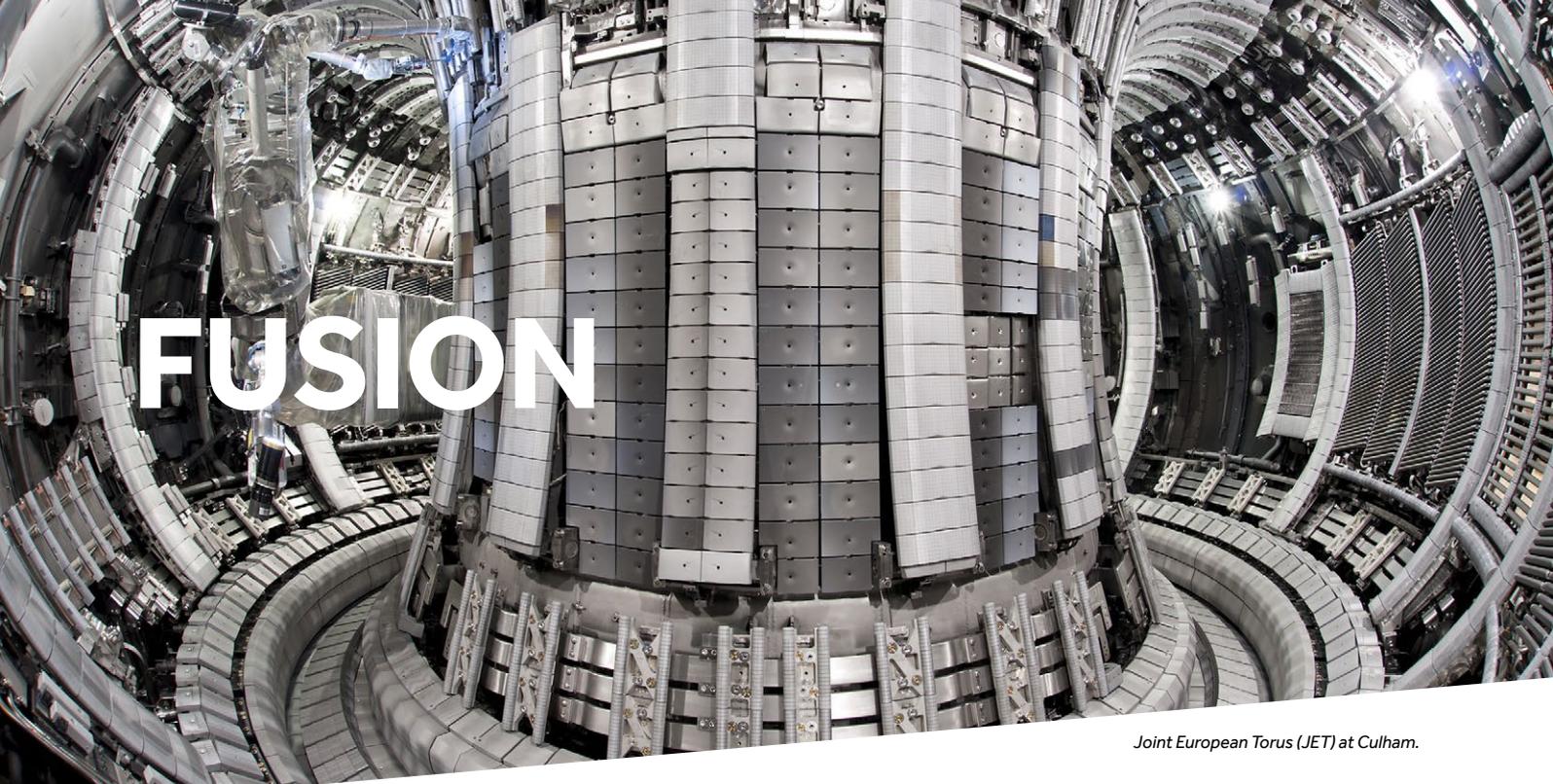
The [Faraday Institution](#)'s Fast Start projects have helped to accelerate battery technology through research into new materials, increased capacity and weight reduction. It has supported innovators such as:

[Nextrode](#), a consortium of five university and six industry partners led by the University of Oxford, is a project to revolutionise the way battery electrodes are manufactured and to make EV batteries longer-range and more durable.

[Energy Superhub Oxford](#) (ESO), a three-year £41m project announced in 2019, is one of four demonstrator projects part-funded (£10m) through the government's Prospering from the Energy Revolution Challenge. ESO will showcase electric vehicle charging and smart energy management technologies. Projects include the installation of a UK first hybrid battery energy storage scheme. Its partners include Invinity Energy Systems, Kensa Contracting, Habitat Energy, and Pivot Power.

[Project LEO](#) (Local Energy Oxfordshire) is one of the most ambitious, wide-ranging and innovative smart grid trials ever conducted in the UK. It is looking at how to accelerate the transition to an energy system that doesn't rely on fossil fuels by piloting a flexible approach to electrical energy provision. The 18GWh Ray Valley Solar Park provides a crucial 'anchor load' of clean electricity generation as it demonstrates the potential for the coordinated use of local generation, storage and demand in decarbonising the energy system. Led by [SSEN](#) it is an [InnovateUK](#) partnership project.

[V2GO](#), or Vehicle to Grid Oxfordshire, is an EDF-sponsored project led by the University of Oxford involving a consortium of Oxfordshire partners that is investigating how electricity stored in EVs can be used to flow back into the grid, turning cars into energy storage units.



# FUSION

*Joint European Torus (JET) at Culham.*

Oxfordshire is a world leader in fusion energy research and innovation. Backed by at least £400m in funding from the government over the next few decades, the county is home to UKAEA's national fusion energy laboratory.

The £222m [STEP](#) (Spherical Tokamak for Energy Production) programme, operated by Oxfordshire-based [UKAEA](#), will result in the design of a prototype commercial fusion power plant that will be built by 2040. UKAEA also operates the Joint European Torus (JET) – the world's largest and most powerful tokamak – on behalf of its European partners, and the Mega Amp Spherical Tokamak (MAST) Upgrade device.

Private sector companies with ambitious research programmes that are progressing rapidly and attracting new investors and collaborators include:

- [Tokamak Energy](#) at Milton Park near Didcot, a spin-out from Culham Laboratories in 2010, is developing fusion energy. It has raised over £117m of private investment since it was founded 10 years ago – £67m in 2020 – and has expanded rapidly through two of Oxfordshire's world-leading clusters: fusion energy and high temperature superconducting magnets. It has 150 employees, recruited from a base of highly skilled engineers and scientists in the region.

**June 2021:** Canadian company [General Fusion](#) announced it is to build and operate its Fusion Demonstration Plant (FDP) at Culham, in a historic public-private partnership with support from UKAEA and a global consortium of industrial companies which will speed up the commercialisation of fusion technology with power plant-relevant demonstrations. At 70% scale, the FDP will heat hydrogen plasma fuel to fusion temperatures of 150 million degrees. Construction begins in 2022.

- [First Light Fusion](#), based in Begbroke, is researching energy generation by inertial confinement fusion. Spun out of the University of Oxford in 2011, with seed capital from the IP Group, Parkwalk Advisors and angel investors, the company raised £18m in its 2020 investment round from Australian group Hostplus as well as UK investors and Oxford Sciences Innovation.

## SUPERCONDUCTING MAGNETS AND CRYOGENICS

Oxfordshire has a well-developed cluster in superconducting magnets and cryogenics, with organisations collaborating across a wide range of industries.

In conjunction with the [Oxford Centre for Applied Superconductivity](#) and the Rutherford Appleton Laboratory, the Superconductivity Hub is a joint project between the [materials](#) and the [physics departments](#) of the University of Oxford, local industrial partners and research centres with interests in future applications of superconducting materials. It pursues projects that can lead to future technologies and the discovery of novel superconducting materials. The superconductivity market is estimated to be worth £2.7bn by 2027.

Oxfordshire is home to the most powerful concentration of cryogenic expertise in the world. Cryogenics are a critical enabling technology for fusion energy, maintaining low temperatures for superconducting magnets. Cryogenics has a broad range of applications, from food freezing and medicine to defence and security, in a market estimated to be worth £12.9bn by 2025 with a 6.4% CAGR. Our key companies include Oxford Instruments, the University of Oxford's first spin-out in 1959, manufacturing superconducting magnets and ultra low temperature refrigerators for research and industrial applications.

# A SKILLED AND PROFESSIONAL WORKFORCE



Oxfordshire has the talent to enable companies to capitalise on ideas that will shape the future for the energy sector.

Key facts:

- Its world-class universities offer highly trained graduates, between them educating 42,000 students
- Salary costs in the UK are competitively lower than other key global locations.
- The fusion sector alone employs more than 2,000 people.

As well as its two universities, there are highly-regarded technical colleges specialising in energy.

[University Technical College Oxfordshire](#) opened in September 2015, catering for students aged 14-19. It specialises in science and engineering and is backed by leading companies in these industries. It is the first school in the UK to open a state-of-the-art cryogenics laboratory.

[Abingdon & Witney College's](#) Advanced Skills Centre is a high-tech higher education hub dedicated to science and engineering training.

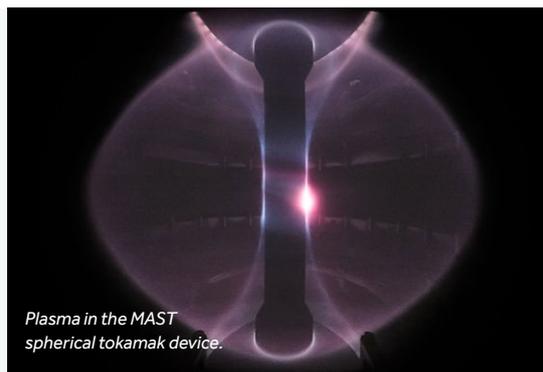
[Oxfordshire Advanced Skills](#), located at the Culham Science Centre, offers high quality training for apprentice engineers and technicians working in Oxfordshire's technology businesses. It runs a unique engineering manufacturing technician apprenticeship.

## CASE STUDY

### Hotter than the sun

"We are delighted to be expanding here in Oxfordshire where we are able to recruit exceptional talent for Tokamak Energy. We pride ourselves on having a highly-skilled team of scientists and engineers with a vast array of knowledge, experience and determination." Jonathan Carling, CEO of Tokamak Energy.

[Tokamak Energy](#) is accelerating the development of efficient and affordable fusion power through its team of world-class fusion scientists and magnet engineers. Its rapid innovation approach uses the latest materials and technology while building on decades of scientific research and experience to find a faster way to fusion. Their scalable technology



Plasma in the MAST spherical tokamak device.

could be rolled out across the world as a solution to one of humanity's greatest challenges: clean and sustainable energy for all.

In March 2021 it announced that its ST40 spherical tokamak fusion energy device, which achieved temperatures hotter than the centre of the sun in 2018, is now on track to achieve fusion temperatures of 100 million degrees – the first time a privately-owned company has delivered this milestone.



Credit: A2Dominion

# A VIBRANT AND DIVERSE PLACE TO LIVE

**Climate leadership:** [Oxford](#) is one of 18 cities globally to be highlighted for its climate leadership in the latest REN21 Renewables in Cities Global Status Report. The 2021 edition of the report, the only stocktaking of cities' energy transition efforts worldwide, shows that one billion people live in cities with a renewable energy target or policy.

**Communities steeped in history:** The UNESCO World Heritage site at [Blenheim Palace](#), Oxford's dreaming spires, and Banbury Cross of nursery rhyme fame are just a few of the landmarks dotted around the county.

**Beautiful outdoor spaces:** Many towns and villages sit within the Cotswolds, North Wessex Downs and Chilterns Areas of Outstanding Natural Beauty, and rivers and canals add to the landscape and host water-based activities.

**Supremely well connected:** The city of Oxford is an hour's drive from London and 45 minutes from [London Heathrow](#), the UK's largest airport. Trains run frequently from Oxford's two mainline stations, linking it to London in less than an hour as well as to Birmingham, and the north and the south coast.

**A fusion of traditional and modern living:** The historic streets of Oxford and thatched cottages in rural hamlets don't mean you have to live in the past - 97% of properties benefit from fibre broadband.

**Museums and culture:** A wide range of museums, galleries and theatres means you are never short of cultural opportunities to explore, including the [Ashmolean Museum](#) in Oxford and several National Trust properties.



**Retail therapy:** The new [Westgate Oxford](#) shopping centre and [Bicester Village](#) offer a wide range of global brands alongside exceptional dining and leisure facilities. Small independent traders can be found on many high streets, offering boutique products manufactured locally and from further afield.

**Excellent educational opportunities:** In addition to the two universities, there are many fantastic schools in the state and private sector, ensuring choice for all.

**Safe and welcoming communities:** Newcomers are welcomed by communities with many people willing to offer help and advice, and the county also benefits from low levels of crime.

**Literary, TV and film connections:** Home to filming locations for productions including; Inspector Morse, Harry Potter, His Dark Materials and Downton Abbey. The annual Oxford Literary Festival celebrates world-class writers in the city of Lewis Carroll, CS Lewis, JRR Tolkien and Phillip Pullman.

**Gastronomical delights:** From high end cuisine offered by Michelin starred restaurants to a pint of locally brewed Hooky Ale poured in the village pub, there is no shortage of places to eat and drink.



# 10 REASONS TO CHOOSE OXFORDSHIRE FOR ENERGY

1. Opportunities to collaborate with exciting spin-outs from the University of Oxford.
2. Proven success in attracting international energy companies and a growing number of manufacturers and developers of electric motor and vehicle technology.
3. Track record of attracting inward investment from around the world.
4. World-class research facilities.
5. Thriving energy ecosystems, facilitating knowledge exchange.
6. World leading region for fusion energy research and innovation.
7. Flourishing low carbon energy sector, generating around £1.14bn a year.
8. Highly-educated population and technically-skilled workforce.
9. Region's low carbon economy employs 9,000 people.
10. Excellent connectivity to the rest of the UK and easy access to major airports.



The JET buildings at Culham. Credit: EUROfusion

# SUPPORT FOR INVESTORS

Investors in Oxfordshire are supported by our inward investment team, which offers tailored assistance and a range of support including:

- Identifying commercial premises and co-ordinating property viewings
- Facilitating introductions to the University of Oxford and Oxford Brookes University
- Making introductions to Oxfordshire's science and research facilities
- Connecting businesses with professional service providers, business support organisations and sector specific networks.
- Offering assistance with graduate recruitment and training support including apprenticeships
- Supporting the relocation of employees and their families
- Providing ongoing support to Oxfordshire-based companies

## Investment Opportunities

### Culham Science Centre

The centre is seeking a partner to invest up to £70m to deliver up to 30,000 square metres of commercial space for a waiting list of occupiers.

### Bicester Motion

The world's first automotive leisure resort, (pictured), will be dedicated to driving and the very latest in high-tech engineering. With a 344-bed hotel and spa, conference centre and airport, the £140m project is seeking investor partners.

Bicester Motion.





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[www.oxfordshirelep.com/business/invest-oxfordshire](http://www.oxfordshirelep.com/business/invest-oxfordshire)



 @oxfordshirelep

 Oxfordshire Local Enterprise Partnership

