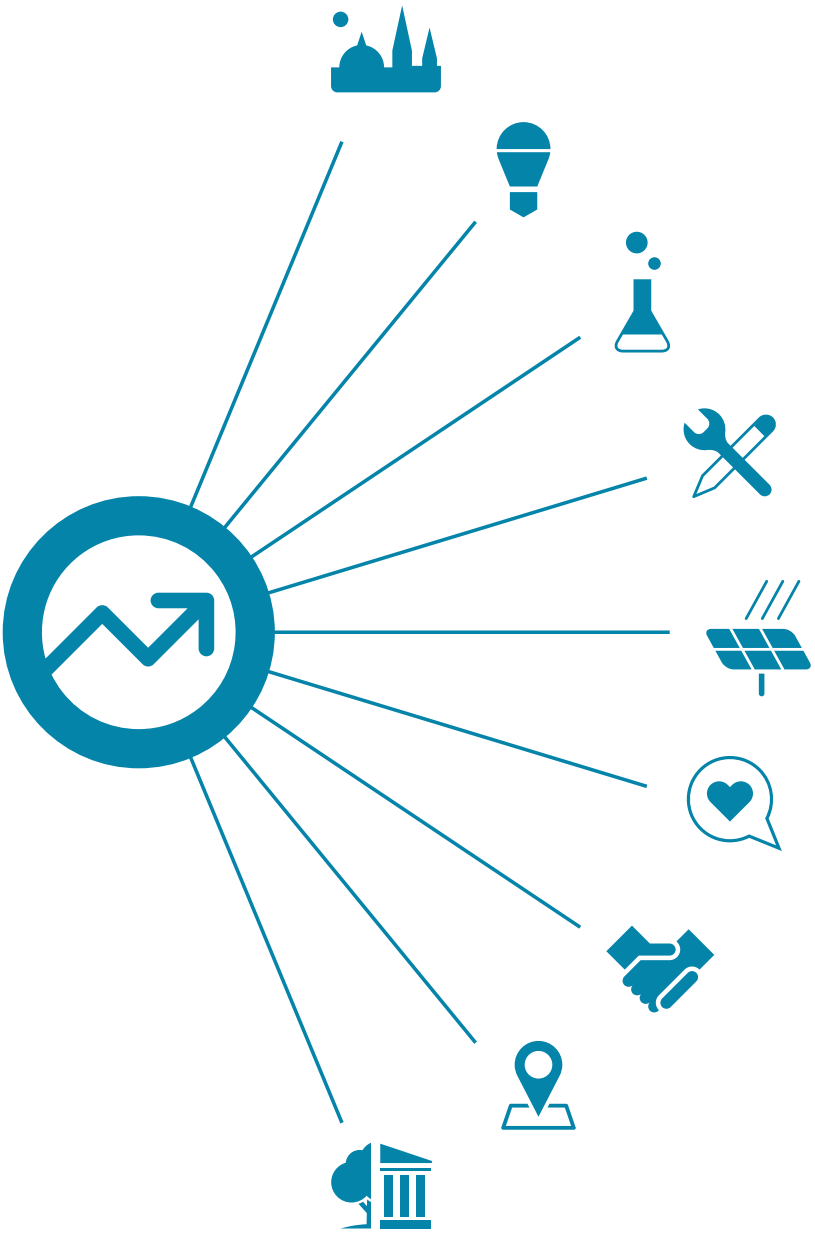
JOINING THE CROWD:
GROWING A NEW ECONOMY FOR OXFORDSHIRE



This booklet is a snapshot of Oxfordshire's low carbon economy and the potential opportunities for growth, jobs and a vibrant local economy. It has been developed from the "Oxfordshire Low Carbon Economy" report, published earlier this year. The report, and the research project, was a collaboration between Low Carbon Oxford and the Environmental Change Institute at the University of Oxford. In the spirit of partnership that informs LCO's ethos, input and engagement was sought from LCO's Pathfinder organisations (some of which are featured in this booklet), as well as other businesses and stakeholders across the County. Particular thanks go to Oxford City Council, Oxfordshire County Council, the Oxfordshire LEP, Oxford Bus Company, Oxford Brookes University, the University of Oxford and the Low Carbon Hub.

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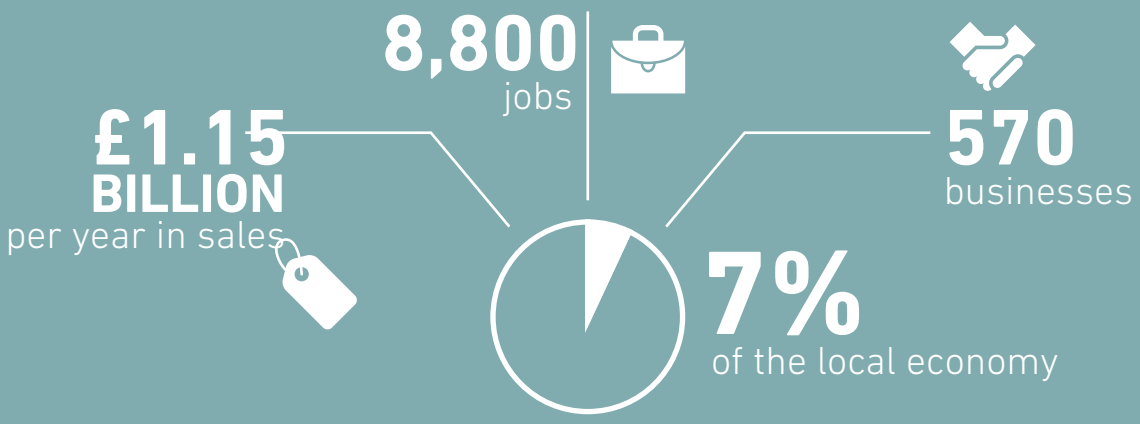
WHERE ARE WE NOW?

We are at a pivotal moment in the shift towards a new energy economy. The next 20 years will see a huge expansion in the world market for low-carbon goods and services, driven by the need for energy security in the face of climate change. This global phenomenon should spur enterprise, innovation and growth, giving impetus to our local economy. It also gives us the chance to make Oxfordshire a better place to live and work.

#1 The numbers

Source: *Oxfordshire's Low Carbon Economy*



Oxfordshire's new energy economy is already significant

The low-carbon market already accounts for a significant part of our local economy. We are home to global and national businesses, hundreds of SMEs and investors, and we have an increasingly vibrant start-up community. Social enterprise is thriving too, in renewable energy, car-pooling, reducing food waste, education and skills, and community development. This economic and social engagement is a launch pad for the county to grow its economy with the global low-carbon market. There is a clear economic case – made stronger by the current low cost of borrowing – for concerted action **now**.

We are all involved

All of us – householders, commuters, economically active, in education or retired – are part of the new energy economy. SMEs that provide products and services to large enterprises are just as critical as research teams, engineers, business leaders and investors. And as consumers and purchasers we see the effect on our pockets from more efficient vehicles and improved transport. We appreciate the comfort of well-insulated homes and workplaces, and the lower running-costs of efficient equipment.

COUNTY POISED FOR PROGRESS

Building on natural advantages

New energy systems have, throughout history, spurred economic progress. Oxfordshire is ideally placed to lead the deployment of an energy system fit for the 21st century. Human and financial capital, an established low-carbon economy and a global reputation for new ideas are major local advantages.

#2 Factors for local success

Two world-class universities, both with energy research programmes, signal Oxford's concentrated knowledge, expertise and human capacity. Add to this the high-tech economic clusters found at Harwell and Culham, the engineering experience of Motorsport Valley, Oxfordshire's skilled labour force (47% of whom are graduates compared to 34% in the UK as a whole), and a countywide economic plan focused on innovation and enterprise, and we have ideal ingredients for economic growth.

Based on these advantages, an 'ecosystem' of enterprise, research, market growth and local engagement is already in place:

The low-carbon service sector is expanding

There are strong networks in business, research and local government

Community groups are significantly more active here than in other parts of the country

Strong local commitment

Oxfordshire recognises the benefits of a new energy future in terms of the economy and quality of life. The county has an ambitious strategic plan for economic growth which halves CO_2 emissions by 2030, in line with national, EU and global targets. This major shift will require new ideas and practical changes in both technology and society.

We already have world-class general engineering businesses, which underpin many low-carbon technologies. Changing our energy economy requires us to focus too on three nationally acknowledged areas of local strength:

AUTOMOTIVES
see pages 8 & 9

BUILDING TECHNOLOGIES
see pages 12 & 13

RENEWABLE ENERGY
see pages 14 & 15

All these areas, plus their extensive service networks, have huge potential to grow as markets for new energy technologies increase.

Scenarios for growth

Oxfordshire's Low Carbon Economy[1] outlines three scenarios for low-carbon innovation and infrastructure investment (see pages 21 & 22). This booklet focuses on the most ambitious, because it offers the highest rewards in both financial and carbon-reduction terms. And because we believe it is right to be ambitious. Nevertheless, because the county is already engaged in decarbonisation, even the 'business as usual' scenario shows progress towards a new energy economy.

[1]A 2014 report by the Environmental Change Institute and Low Carbon Oxford

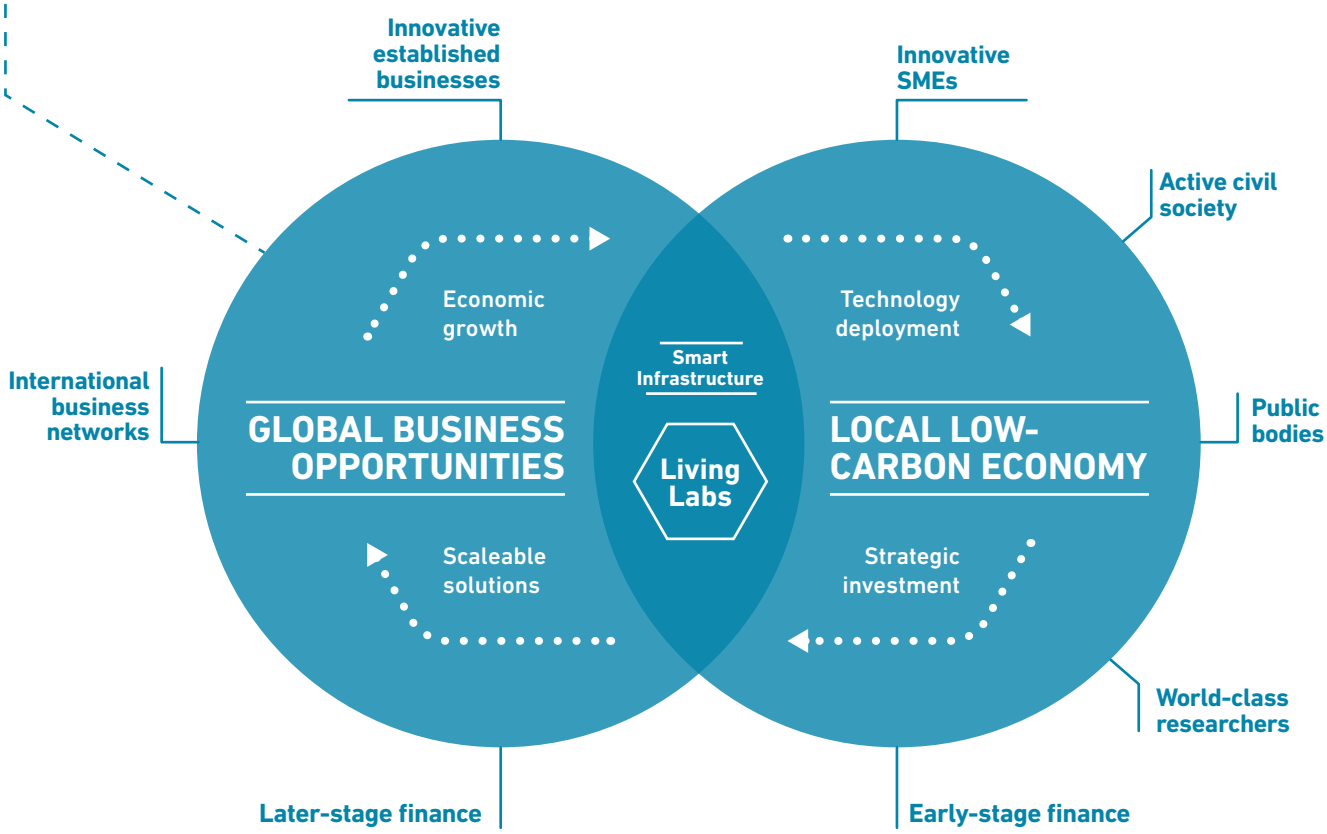
RACING TOWARDS A LOW-CARBON ECONOMY

The winners will be those who use low-carbon as a spur to growth. Here in Oxfordshire, the prize is increased sales, thousands of new jobs, a robust local economy, a vibrant business ecosystem, and better homes, workplaces and transport.

How do we create a new energy economy?

First, we need to think big. A low-carbon economy includes renewable energy but its totality is far larger. It comprises all the goods, services and infrastructure that, together with changes in our behaviour, reduce our carbon footprint. It is a positive force, bringing better transport, connectivity, knowledge exchange and living spaces. And it is full of potential markets.

#3 Low-carbon living laboratories driving the economy



Adapted from: *Oxfordshire's Low Carbon Economy*

Collaboration is crucial

The multi-faceted nature of a low-carbon economy calls for broad-based, agile thinking and doing. Diverse partnerships will create unexpected opportunities and synergies. Local SMEs, large organisations and community enterprise can help create markets and demand.

LOCAL OPPORTUNITIES

Revitalising local infrastructure can drive a range of markets for low-carbon business growth. The process will also provide living laboratories for new technology and foster synergy between research, business, local government and social enterprise. New skills will be needed at all levels – from the building trade, project management, business management and support, to high-tech research – so human capital will also grow. The improved housing stock and transport systems will make a huge difference to our daily life.

up to 11,000 new jobs

leading innovation in low carbon technologies

£1.35 billion per year boosting local economy

REWARDS

which the county stands to gain by 2030. To achieve them requires private and public investment of £300 million per year for the next 15 years. To put this in context, we already spend £1 billion every year – cash that is lost to the county to become someone else's profit – on importing carbon-based energy.

GLOBAL OPPORTUNITIES

Export-led business will enable Oxfordshire to claim a share of the growing world market for low-carbon goods and services.

by 2030...*

40 million of electric vehicle (EV) and plug-in hybrid EV yearly sales, up from 80,000 in 2012

Photovoltaic capacity projected to increase from 22GW to **700 GW**

Wind energy capacity will increase from 158GW in 2012 to **1,400 GW**

#4

* Source: International Energy Agency

RESEARCH, SERVICES AND DEPLOYMENT

The new energy economy is like an iceberg – mostly out of sight. Economic clusters are emerging, but research rarely takes centre-stage and support services are hardly noted.

Economic clusters

Low-carbon technology is poised to become the latest world-class cluster in Oxfordshire, following the established successes of life sciences, engineering, and space and satellite development.

THE LOW-CARBON ECONOMY IS READY TO GROW

- **The Carbon Trust puts Oxfordshire in the top five counties in the UK for low-carbon enterprise (by total number of relevant SMEs)**
- **In 2012 the county generated £2,000-worth of low-carbon and environmental goods and services per head, and employed 1.6% of the population in these sectors**
- **We have intellectual critical mass: Oxfordshire has 1,500 high-tech firms employing 43,000 people, and there are 6,400 people in R&D in knowledge-intensive businesses**
- **The Oxfordshire Local Enterprise Partnership (OxLEP) supports low-carbon businesses via the Innovation Support for Business programme**

Low-carbon ecology

Innovative SMEs in a technological ecosystem need access to finance, talent, networks and markets. New technologies, new business models and new applications of existing technologies must be thoroughly tested in the real-life setting of 'living laboratories'.

TESTING GROUNDS

'Living laboratories' are partnerships where prototypes, particularly in the fields of transport, energy and building innovation, are tested in 'real-life' application. The design, deployment and commercial viability of these prototypes are tested ready for market release and/or investment.

SEVEN KEY ELEMENTS TO CREATE A LOW-CARBON ECOSYSTEM

- Research - support low-carbon researchers to win grants from EU and UK research councils
- Human capital
- Access to markets and finance
- An SME and entrepreneur community
- Deployment via thorough testing in living labs
- Large-scale manufacturing
- Support services for low-carbon activity

Strong foundations

AN INTERDEPENDENT 'DESIGN ARMY'

The developers and manufacturers of new technology are the first among equals in the low-carbon ecosystem. Their peers, co-creators of a new-energy society, are a diverse set of businesses, institutions and individuals. Designers of Oxfordshire's new energy system

- Policy-makers in a range of fields – transport, housing, energy, agriculture, education, planning
- Professionals – accountants, architects, bankers, lawyers, marketing specialists, planners
- Practical services - caterers, cleaners, builders, managers, logistics providers, security firms
- Investors, including social enterprise groups
- All of us, through our choice of housing, domestic heating, food consumption, transport

RESEARCH

The county has world-famous R&D capacity in overlapping areas of high-tech:

- Bioscience, medical technology, pharmaceuticals
- Digital, media and ICT (hardware and software)
- Physics-related – magnets, instruments, cryogenics
- Engineering and electronics

The new energy economy relates to all of these sectors and collaboration could grow. Oxford Brookes and Oxford University are making impressive efforts to reduce the carbon footprint of their buildings and operations in tandem with their low-carbon research. All of LCO's Pathfinders commit to reducing their carbon emissions on average by 3% each year. Learning from each other, access to new research and sharing best practice is key to achieving that shared goal.

SYNERGY FOR SUCCESS

The complexity of a thriving low-carbon ecosystem is challenging and many of us do not yet see our full roles in this emergent economy. We need to allow for the 'cluster effect', where the intersection of clusters – such as biotech, infotech and cleantech, as in Cambridge's case – leads to the cross-fertilisation of ideas and the emergence and commercialisation of innovations.

This needs better connectivity and collaboration throughout the clusters and beyond. But the basics are firmly in place to increase synergy and attract inward investment and human capital.

LOCAL ADVANTAGE 1: AUTOMOTIVES

Oxfordshire has been famous for its cars for over a century. The growing world market in alternative-fuel cars and buses is a great opportunity for the county to build on current success. And cutting exhaust emissions means cleaner air for everyone.

Transport challenges

Efficient transport is vital to the economy. But population growth and new centres of employment are stretching Oxfordshire's transport infrastructure.

Transport is the highest CO_2 emitter in the county – Oxford's Low Emissions Strategy sets a city target of 35% reduction in transport CO_2 from 2005 to 2020, with similar targets for other towns.

17,000 vehicles cross Folly Bridge every day; 40,000 people commute into Oxford daily, mostly by car (only 5% by bus, 4% by bike); there is significant commuting along the Knowledge Spine.

Shortage of affordable housing near Oxford compounds the traffic congestion by increasing the number of commuters; transport planning must examine where we live and work.

Transport governance is fragmented.

Case study: Buses benefit from F1 racing technology

A flywheel energy recovery system developed for F1 racing cars is now being used in bus engines.

The Oxford Bus Company's parent company provided six buses and engineering expertise for the trials; Innovate UK covered 75% of the cost. After a successful trial period, the Gyrodrive flywheel technology has been fitted to 14 Brookes Buses.

CO_2 emissions should be reduced significantly and annual fuel cost savings – from better economy and the central government fuel duty incentives – will be more than £110,000. People living on the bus routes will enjoy cleaner air too.

DYNAMIC INNOVATORS

Drayson Racing set a new World Electric Land Speed Record – 204.185mph – in a car powered by four Yasa electric motors

The City Council's growing electric car pool is 14-strong plus 3 hybrid EVs and 9 electric bikes

More than a third of Oxford Bus Company buses are hybrid EVs

North Oxford has one of the UK's first electric car clubs

STRATEGIC ENABLERS

Solving the current lack of transport capacity is a joint challenge for planners, manufacturers, transport operators, businesses and residents.

The local transport plan augments national nudges towards cleaner transport with less air pollution (vehicle excise duty, fuel tax, emissions standards)

£800 million (mostly private-sector) investment should reduce congestion, shorten rail journey times and improve transport infrastructure by 2020

Under the City Deal, the private sector is to invest £1.1 billion on the road network, including a potential transit link from Bicester to Science Vale

Remote Park and Ride sites might be built closer to journey sources than destinations

INTEGRATED TRANSPORT LIVING LAB

Proposed short-term solutions

Transform Park & Ride (P&R) into user-friendly multi-modal 'hubs'

Access to shops, SMART ticketing, shopping collection, rail, bus, bike hire

SMART family ticketing - integrated ticketing across travel options

Buy-in from retailers - to build on existing ticketing projects

SMART info and dynamic signage on entry to ring-road

Improved journey planner and app development

Park and cycle, including e-bikes available at P&R

More flexible space for buggies/shopping on P&R buses - bus interior re-design

Shopping collection points at P&R - shopping delivered to P&R

#4

Adapted from: MobOx

LOW CARBON IN PRACTICE

Oxfordshire's emerging low-carbon technology and expertise cluster is ready to take centre-stage. There is a compelling economic case, based on existing advantages and the pressing need to reduce carbon emissions, for the county to grow through a new energy economy.

#5

500+
firms

£10m
of community/crowd funded investment in renewable energy projects

60+
community groups

BEGBROKE SCIENCE PARK

Oxford University's cross-departmental research facility and science park with 12 000 m² office/laboratory space for 20 research groups and 30 high-tech science-based businesses and spin-outs, including Oxford PV.

OXFORD PV AND OSNEY LOCK HYDRO

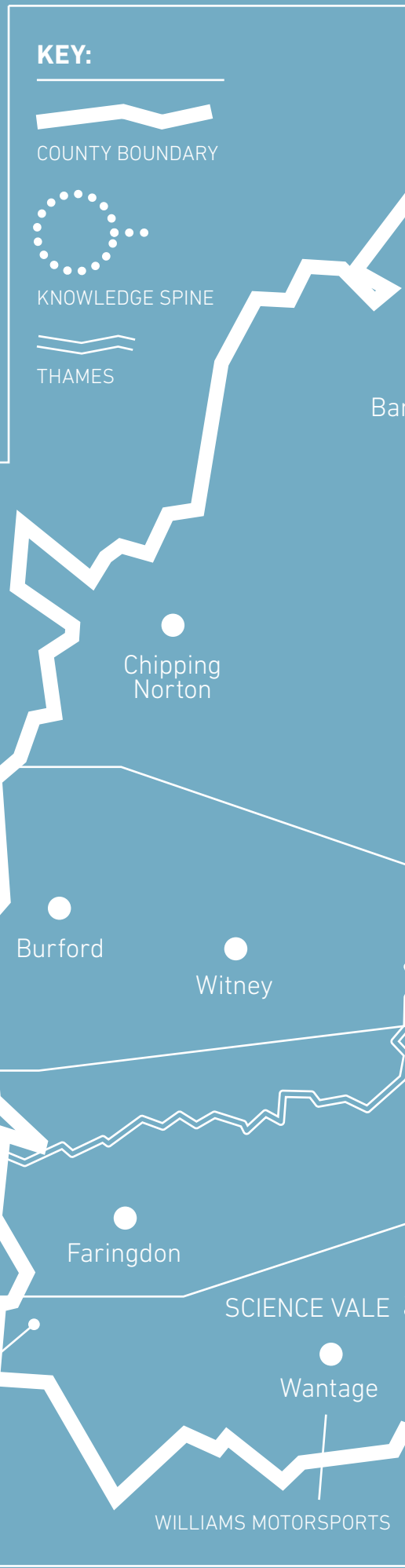
This social venture uses micro-hydro and solar power to generate electricity and an income stream for other energy projects. The solar technology includes transparent panels invented by Oxford PV, an Oxford University spinout. Oxfordshire County Council provided a grant towards the installation of the panels. The Low Carbon Hub facilitated both projects.

ABINGDON HYDRO

A not-for-profit company set up by local residents, to generate hydroelectric power from the River Thames by Abingdon Weir.

WESTMILL SOLAR PARK

The site consists of 30 acres of over 20,000 polycrystalline PV panels generating 4.8GWhr/year – approximately equivalent to a year's electricity consumption of 1,400 homes in Oxfordshire and enough to prevent 2,000 tonnes of carbon dioxide emissions annually. It is the UK's largest cooperatively run, community-owned solar farm.



BICESTER ECO-TOWN
Exemplar phase in development

IMPROVING GRID CAPACITY IN BICESTER

Collaboration between Cherwell District Council, Oxfordshire County Council, Low Carbon Hub, Bioregional and local business stakeholders to develop a smart grid pilot in the new eco-town development.

BUILDBASE
National HQ of builders merchants serving SMEs and DIY enthusiasts

MINI PLANT OXFORD
58% of current range of Minis made in Oxford, likely to expand with Mini E; 3MW rooftop solar PV installation went operational in June 2014

OXFORD CITY COUNCIL
Working to reduce Oxford's carbon emissions by 40% by 2020
Lead partner in the OxFutures programme
Provided a £2.3million construction loan facility to the Low Carbon Hub

OXFORD BROOKES UNIVERSITY
On target to reduce its CO_2 emissions by 50% by 2020.
Research and local business partnerships on sustainable buildings, advanced engineering and social enterprise

OXFORD UNIVERSITY
Over 400 energy researchers addressing technical, social, economic and policy issues at global, national and local scales

SOLAR POWER SCHEME FOR OXFORD BUS COMPANY

Solar PV installed on the Oxford Bus Company roof in Cowley provides the company with low-cost electricity. Investors in the PV project benefit from the EIS/SEIS Scheme to get an increased return and the Low Carbon Hub receives an income stream to support and fund community energy projects.

JENNINGS BUSINESS PARK
Work in progress to take business park off-grid

CENTRE FOR ECOLOGY AND HYDROLOGY
Centre of Excellence for integrated research in hydrology, terrestrial and freshwater ecosystems

LOCAL ADVANTAGE 2: BUILDING TECHNOLOGIES

Plans to retrofit our existing housing stock and create up to 100,000 new homes over the next 15 years will benefit Oxfordshire's low-carbon building technology sector. More houses, clever planning and changing work patterns will reduce commuting pressure and improve quality of life.

Our existing buildings waste energy

- Most of our existing homes (almost 273,000) and commercial properties can dramatically cut their rising energy bills through refurbishment
- Retrofitting 10,000 houses every year will provide work for a quarter of a century
- Oxfordshire has many ancient buildings, which need sensitive treatment to preserve their historic character – the technology and skills to deal with important old buildings will have market value in other historic sites

Oxfordshire needs new houses too

- Up to 100,000 homes, plus related service and amenities, may be needed (almost twice as many as are already in Oxford city) by 2030
- Local councils have already identified sites for 50,000
- All new housing from 2016 must meet stringent new targets for energy efficiency, so demand for low-carbon building technology, as well as skills, must grow

Improving household energy efficiency has significant social value. We have the chance to reduce fuel poverty and the 'heat or eat' dilemma faced by low-income households during the winter.

Case study: Oxford Whole House Carbon Reduction Project

Low-carbon refurbishment made a Victorian semi more comfortable, with significantly lower heating costs and CO_2 emissions.

Undertaken as part of Innovate UK's Retrofit for the Future programme, this refit used widely available techniques and materials. Insulating the walls and loft, and fitting triple-glazing gave 60% energy savings. Further savings were made via a high-efficiency boiler, low-energy appliances and lighting, solar PV for electricity and solar thermal for hot water. Mechanical ventilation with heat recovery ensured fresh air within the house. Carbon emissions were down 80% in the first year.

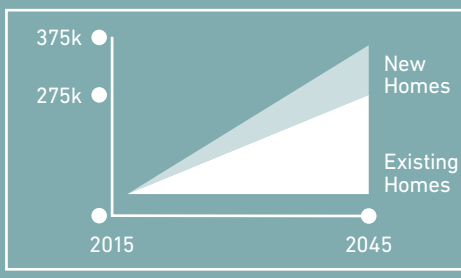
Two lessons:

Training builders how to fit the new materials and technology is essential.

Occupiers need to learn how to use their home in the most energy-efficient manner.

HIGH-TECH AND THE BUILDING TRADE

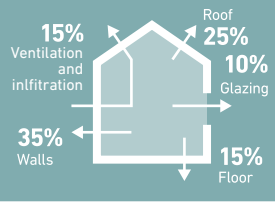
- New technology demands new building skills - we need to invest in modern vocational training
- Good project management skills and innovative architects are also vital
- We need to reduce the 'design-performance gap' between theoretical and actual improvement in energy use
- Oxford Brookes is doing major energy-related research on buildings and planning



GROWING MARKETS FOR FUTURE-PROOFING OUR HOMES

ROOM FOR IMPROVEMENT

Breakdown of heat loss from a typical UK home



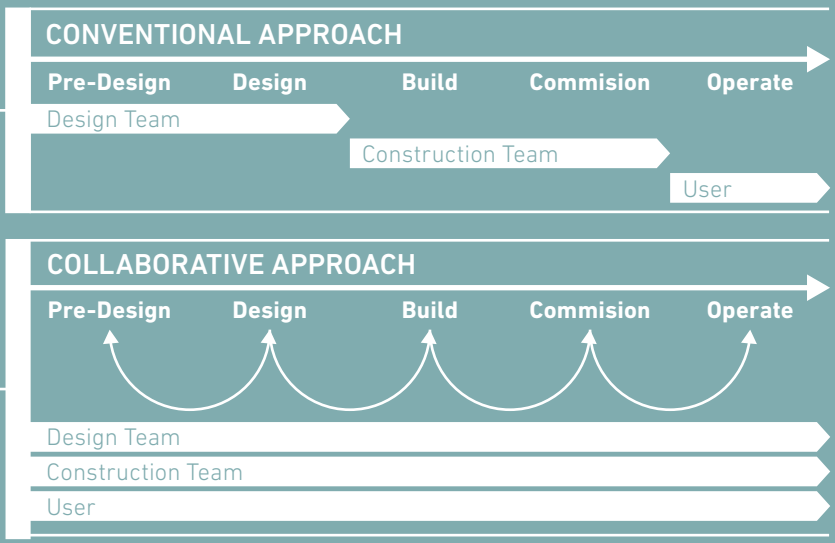
TRANSFORMING THE MARKET

Some nudging may be needed to develop the low-carbon building market, as new technology is often more expensive to install – the savings come later. Tighter building regulations would help. We need to stimulate demand for low-carbon goods and services, and build capacity to deliver them.

CO-CREATION

Innovators, architects and the building trades need to work together to fuse design and workmanship. Ideas are refined as they are put into practice, and modified too by the behaviour of those who live or work in the buildings – another example of a living laboratory

#6



LOCAL ADVANTAGE 3: RENEWABLE ENERGY

Using less energy is one part of the low-carbon equation – especially with electricity prices set to rise over the next five years and concerns over supply. Another is to find alternatives to fossil fuels (which cost the county £1 billion to import every year). Oxfordshire has been active in energy research since the Harwell nuclear reactor was built in 1946, and could lead the way towards low-carbon energy production.

A head start in research

- Intellectual capital and active R&D
- Harwell's work already encompasses renewables and energy efficiency
- Knowledge transfer and spinouts from both universities
- Local expertise and commitment to clean energy, reflected in community-led energy projects
- University of Oxford alone has over 400 researchers in energy

Components of a smart grid

We need new ideas to balance supply and demand in real time. Dealing with the intermittent energy supply from renewables and minimising excess spare capacity will require expertise in areas where Oxfordshire is already strong:

- Energy storage (batteries and hydrogen)
- Control systems
- Data analysis and energy management software

Energy direct from the sun

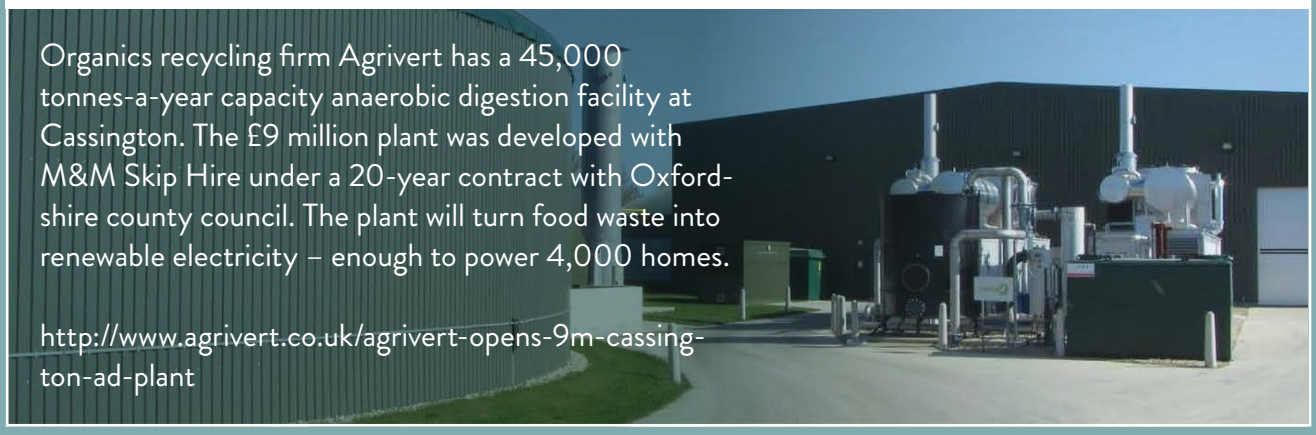
- Solar power - roof installations on homes and commercial buildings, plus solar farms - provides the largest contribution to renewable power in the county.
- PV Crystalox Solar plc, based in Abingdon, was one of the first companies to develop multicrystalline silicon technology on an industrial scale.
- Oxford PV, a start-up using perovskite technology to embed PV in glass, was included in Science magazine's top 10 global breakthroughs of 2013

Oxford PV: a global top ten breakthrough

"A new breed of materials for solar cells burst into the limelight this year. Known as perovskites, they are cheap, easy to make, and already capable of converting 15% of the energy in sunlight to electricity. One particularly promising feature is that they can be layered on top of silicon solar-cell material to harness a range of wavelengths that neither could capture alone."

http://news.sciencemag.org/2013/12/sciences-top-10-breakthroughs-2013

Case study: Agrivert anaerobic digestor



Organics recycling firm Agrivert has a 45,000 tonnes-a-year capacity anaerobic digestion facility at Cassington. The £9 million plant was developed with M&M Skip Hire under a 20-year contract with Oxfordshire county council. The plant will turn food waste into renewable electricity – enough to power 4,000 homes.

http://www.agrivert.co.uk/agrivert-opens-9m-cassington-ad-plant

REDESIGNING LOCAL POWER GENERATION SYSTEMS

There are great business opportunities from ambitious joint ventures. Local plans include a scheme to develop a district heat network for the Bicester Eco-town. Ground-source heat pumps are becoming more common for large new buildings and some homes in rural areas, reflecting the success of local company ICE Energy, the UK's leading supplier of this technology.

SUPPORTING LOCAL ACTION

Established businesses and social ventures have been significant early adopters of renewable energy, helping to grow new-energy markets in Oxfordshire. They now need better access to technical capacity, finance and human resources to match their innovation and commitment. This will require new forms of collaboration.

#7

POWERING UP

139GWh
per year can already be generated by Oxfordshire – 4% of current demand - from renewable sources. A further 310GWh is in the pipeline.

£50 million
per year planned to be invested by the OxFutures programme in renewable energy infrastructure. This could produce 20% of Oxfordshire's electricity demand.

30%
of the county's electricity demand can be generated by solar PV, anaerobic digestion of agricultural waste and biomass.

ENTERPRISE NUDGING AND INVESTMENT

Decarbonising our economy is a complex and ambitious goal, with many interdependencies. Far-sighted policies, bold entrepreneurs and popular buy-in are vital ingredients. Our early-stage and high-growth businesses need support, and we must change the way we live, travel and work.

Where does policy intervene?

In line with UK climate change targets, Oxfordshire is committed to halve CO_2 emissions by 2030 (compared to 2008). Research, business and the public at large are all being nudged towards this end.

- Land-use planning – space for new companies to set up, access to university and research partners, creative zoning of residential and commercial areas
- Smart green infrastructure and transport networks
- Promoting cycling, walking and non-polluting public transport
- Better work/life integration and new communication technology to reduce commuting
- Financial incentives - tax breaks for new companies
- Community energy policy set by national government

Supportive policy can help increase demand for and boost the capacity to deliver low-carbon skills and technology. It can also encourage coordination between the railways, roads and power-distribution networks.

The nuts and bolts

A key organisation in Oxfordshire's economic strategy is the Oxfordshire Local Enterprise Partnership (OxLEP) which, with the local authorities, is responsible for coordinating investment and implementation of the Strategic Economic Plan.

Investment frameworks

The county has so far proved less attractive to inward investment than similar counties. OxFutures (a joint initiative between the City and County Councils and the Low Carbon Hub) plans to put £400 million into clean energy projects by 2020 – this, plus the OxLEP, is the start of joined-up support to attract more investment:

- The City Deal will invest in a network of innovation and incubation centres, and support business, housing, transport and apprenticeships.
- The Local Enterprise Partnership's Strategic Economic Plan (SEP) aims to invest £6.32 billion – of which about 10% will come from public funds – before 2030 to give £6.6 billion gross value added and 85,000 jobs. The result might be up to 100,000 new homes, better broadband connectivity, improved roads and public transport, and significant investment in skills. The SEP also identifies priority sites along the knowledge spine.

- The European Structural Investment Fund (ESIF) channels EU funds - £2 million will be allocated to support low-carbon innovation and market development between now and 2020
- The Oxfordshire Growth Deal channels UK funds
- The City Council created a £2.3 million revolving loan facility for local renewable energy projects developed by the Low Carbon Hub such as solar electricity from school buildings.

Where does the money come from?

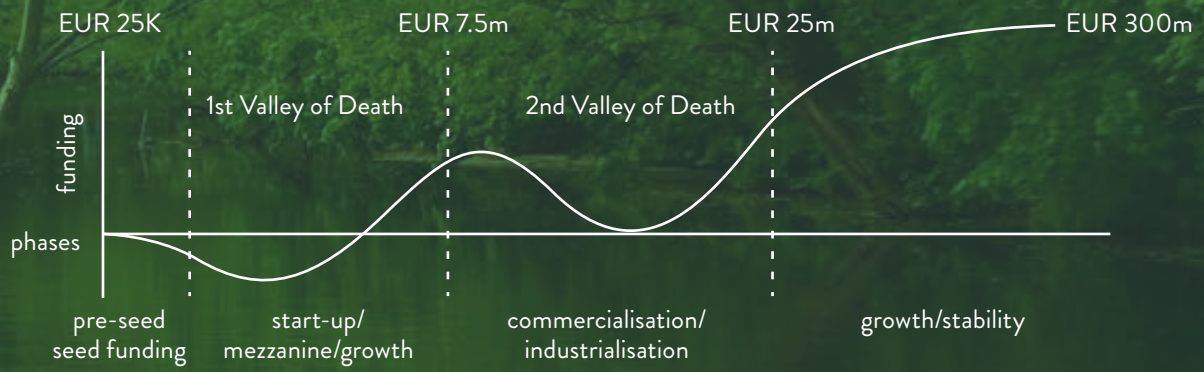
Much of our local dynamism comes from start-ups and SMEs. They bring innovative ideas to market but cannot always afford further research, so we need to galvanise bigger businesses – plus overseas investors – to buy into our local 'innovation engine'.

Funding sources:

- The UK Research Councils
- EU: inc. Horizon 2020, ELENA, Intelligent Energy Europe, European Structural & Investment Funds
- The Manufacturing Advisory Service, Innovate UK, the Catapults & Nesta
- Business incubators such as Climate-KIC, I-TAC and GrowthAccelerator
- Venture capitalists and angel investors fund start-up and early-stage businesses
- Impact investors, particularly for social ventures
- High-street lenders and banks
- Tax breaks and incentives, such as SEIS/EIS
- Local authorities: low-carbon housing and infrastructure
- Established businesses: invest in R&D and supply chain innovation
- Investment and pension funds
- Civil society: though crowd funding and community benefit share offers

What are the risks?

Funding early-stage technology is high-risk and potentially low-return. Innovations to respond to climate change are inherently multidisciplinary, multi-agency and require a long-term perspective. The government acknowledges that low-carbon technologies can take 20 years or longer to develop. This is particularly the case in the new energy economy, where structural change is so fundamental and technology adoptions are dependent on policy, regulation and partnerships with major providers and operators.



#8

The second Valley of Death begins where the welfare-maximising process of government-supported basic research tapers off, and ends where the private profit-maximising process begins.

Source: Low Carbon Innovation Coordination Group, 2013

KEY ASSUMPTIONS

The report on which this booklet is based put forward three scenarios for low-carbon innovation and infrastructure investment. The tables below show the key assumptions in each case.

This booklet has focused on scenario C which is the most ambitious, because it offers the highest rewards in both financial and carbon-reduction terms. Nevertheless, because the county is already engaged in decarbonisation, even the 'business as usual' scenario A shows progress towards a new energy economy.

#9

business-as-usual | steady growth | ambitious growth

2030 Scenarios	A	B	C	Key assumptions
TRANSPORT				
Alternative vehicles & fuels				
Average no. new vehicles per year	33,450	34,417	38,133	Most are cars; figures also include new vans, trucks & buses
Share of EVs in new fleets	1%	10%	25%	
Automotive cluster activity				
Automotive production growth in 2030 (compared with 2014)	150%	150%	200%	
Proportion of new production that relates to low carbon vehicles	10%	25%	50%	
Infrastructure				
No. of EV home charging points installed by 2030	1,000	10,000	30,000	Up to 6,000 per district area, costing £700 each, spread over 15 years
No. of public DC fast and AC slow charging stations	10	100	300	Up to 5 DC and 55 AC per district area, spread over 15 years
Mass rapid transit (km)	-	-	50	Oxfordshire Busway modelled on Cambridgeshire Busway
Cycling infrastructure (km)	-	50	200	Includes cycle routes, bridges, tunnels, interchanges and a bike hire scheme
Influencing travel behaviour				Rising to 100% coverage in scenario C
No. of personalized travel plans for all homes (new and existing)	3,100	32,300	373,000	

HOUSING

New Homes				
No. of new homes by 2030	37,000	50,000	100,000	NB. Many building technologies can contribute to achieving the standard
Energy standard for new homes per unit floor area, kWh/m2 year	50	40	30	
Renovation of existing homes				
No. of existing homes renovated per year	40	400	4,000	
Energy standard for renovations per unit floor area, kWh/m2 year	100	80	60	NB. Many building technologies can contribute to achieving the standard

ELECTRICITY SUPPLY

Renewable heat supply, GWh	63	258	2183	
Renewable heat as a percentage of total heat demand	1%	5%	40%	
Renewable electricity supply	539	842	2052	A = committed projects + new buildings B = A+20% of other potential C = full potential
Renewable electricity supply as a percentage of electricity demand	15%	23%	56%	

Investment, £m/year to 2030

Transport	1	10	49
Housing	14	22	50
Renewable energy	39	65	199
Total	54	97	298

Additional GVA, £m/year to 2030

Transport	54	134	364
Housing	29	41	94
Renewable energy	219	330	889
Total	302	505	1,347

Additional employment, FTE jobs in 2030

Transport	621	1,541	4,256
Housing	618	864	1,972
Renewable energy	1,164	1,764	4,905
Total	2,403	4,169	11,133

Source: *Oxfordshire's Low Carbon Economy*

HOW DO WE JOIN THE CROWD?

If we want the benefits of a holistic new energy economy, we must be wildly ambitious. All of us - world-renowned researchers, creative thinkers, informed investors, bold business leaders, far-sighted planners, an engaged public – need to see the opportunities for Oxfordshire and take action.

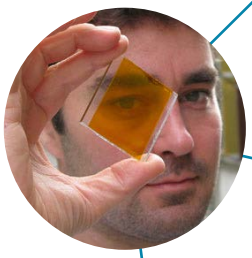
Our vision - the tangible benefits of a thriving new energy economy:

- £1.35 billion-a-year boost to the local economy
- 11,000 new jobs
- Financially sustainable businesses
- Access to new markets for innovative products and services
- A vibrant entrepreneurial community that attracts and retains talent
- Comfortable and warmer homes, and increased choice in housing
- Free-flowing traffic and commuting options
- Locally-generated and locally-owned renewable energy
- Improved health and wellbeing
- Dynamic and cohesive communities
- Better access to amenities

SMEs drive economic growth by:
Stimulating innovation
Acting as a competitive spur to existing businesses to increase their productivity
Making a disproportionately large contribution to job creation

Are you an innovative low carbon SME looking to grow your business?
Are you an investor looking to develop your investment portfolio?
Are you a business owner, community group or property asset manager looking to deploy innovative energy saving technologies?

Get in touch with the Innovation Support for Business team at the OxLEP so that we can bring you into the crowd. Contact Anne Augustine, the LEP's low carbon network navigator at: lowcarbonoxford@gmail.com



Professor Henry Snaith
Founder and Chief Scientific Officer
Oxford PV

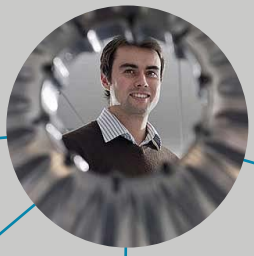
Dr Barbara Hammond
Founder and CEO of the Low Carbon Hub

Catherine Bottrill
Founder and CEO of Pilio Ltd

David Mason
Director of Glebe and Buildings
Oxford Diocesan Board of Finance

Katie King
Director, Aether

#10 IN A NUTSHELL



Dr Tim Woolmer
Founder and Chief Technology Officer
Yasa Motors

Matt Whitehead
LCMB Ltd, Oxfordshire

Anne Augustine
OxLEP's low carbon network navigator
and LCO's programme manager

1. Oxfordshire & the world need to reduce dramatically their carbon emissions over the next few decades.

2. Oxfordshire already has a thriving & diverse low carbon economy, culture & innovation base.

3. Economic analysis has identified 3 low carbon areas in which Oxfordshire has particular comparative advantages in the UK:

- Building technologies
- Automotives
- Renewable energy

4. Making the most of these 3 opportunities – and others - requires potentially "overwhelming" mobilisation of collaborative & inclusive action on several fronts including:

- Local policy
- Technological innovation & deployment
- Financial investment
- Market making
- Critical mass in industrial and commercial expertise
- Cultural leadership

5. Successful mobilisation will result in:

- Jobs in many sectors
- New businesses & wealth creation
- New partnerships and clusters
- Improved housing and work places
- Improved transport and infrastructure
- A new local energy system
- Inward investment
- Reduction in 'lost' expenditure on importing external energy services
- New knowledge & innovation streams
- Lower carbon emissions

6. Two interacting Strategic Outcomes will be:

- Oxfordshire – a better place to live & work (including better homes and travel)
- A multi-skilled enterprise sector capable of exploiting a n immense and growing national and international export market

Professor Rajat Gupta
Director of the Oxford Institute
for Sustainable Development,
Oxford Brookes University

Rebecca Nestor
member of north Oxford E-car club
and Director of Learning for Good

ARE YOU PART OF THE CROWD?

Oxfordshire's ambitions for a low-carbon future are supported by the latest report from the Intergovernmental Panel on Climate Change (November 2014). The IPCC says that most of the world's electricity can – and must – be produced from low-carbon sources by 2050. If not, the world faces severe, pervasive and irreversible damage. Inaction would cost much more than taking the necessary action. The report suggests renewables will have to grow from their current 30% share to 80% of the power sector by 2050.

This booklet argues that the incontrovertible need for low-carbon technology presents a huge market opportunity and that Oxfordshire is well placed to benefit. As well as global pressures, and a global market for goods and services in which we can share, we have local demands from an informed citizenship and as well as those seeking work, economic opportunity and warmer homes. The county has the research capacity, knowledge base and skills to contribute to this change in energy use and has already embarked on the process.

It will not be easy to make the low-carbon transition. But by coordinating our efforts we can all enjoy the prizes of a thriving economy, a better quality of life and a better quality of place.

The Oxfordshire Low Carbon Economy Report was the result of a joint project between the Environmental Change Institute at the University of Oxford and Low Carbon Oxford. It was made possible by grant funding from Santander and Oxfordshire County Council. The full report can be downloaded at: http://www.eci.ox.ac.uk/research/energy/olce/index.php

Contacts:

For more information about business support in Oxfordshire, go to:
http://www.oxfordshirebusinesssupport.co.uk

To get in touch with the low carbon network navigator:
http://www.oxfordshirebusinesssupport.co.uk/content/low-carbon-0

Contact Anne Augustine, the LEP's low carbon network navigator at
anne.augustine@oxfordshire.gov.uk

Or phone: 01865 261448

OBS Oxfordshire Business Support

LOW CARBON OXFORD