

Localising Herefordshire's Energy Economy

Eco² Herefordshire: A Vision of the County's Future

by Richard Priestley

Author's Note

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I have been helped in my understanding of energy and climate-related issues by many people over the years, perhaps none more so than David Olivier. I am also grateful for editorial suggestions from Dave Prescott, Rob Garner and Glenn Storhaug.

While every effort has been made to ensure accuracy errors may remain. Obviously before any financial investments are made, in part perhaps inspired by ideas in this report, more detailed feasibility studies and due diligence will be required.

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Executive Summary

Currently Herefordshire spends about half a billion pounds per year on energy. The vast majority comes from fossil fuels, which are projected to become increasingly expensive. Nearly all of this money leaves the county; most leaves the UK altogether.

By investing in radical energy reduction and renewable energy generation, Herefordshire could turn this £0.5bn annual outflow into a major financial inflow. At the same time it could surpass carbon reduction targets, increase energy security, reduce fuel poverty, improve health and wellbeing, and develop education, training, and employment opportunities.

Pioneering communities in Europe have already achieved very high levels of energy autonomy. For example, over the last 20 years, the small Austrian town of Güssing (pop. 3,800) has turned their €6m annual energy bill into a €15m annual income through the local ownership, generation and supply of renewable electricity, heating and transport fuels. The transformation was instigated by a pioneering mayor and driven forward by a supportive and highly engaged local council. Among other benefits, 1,100 new jobs have been created, helping to reverse the outflow of young people from the area.

Similar transformations have taken place in many places, notably in the Bavarian town of Wildpoldsried and in Frederikshavn in Denmark. In fact, as of March

2012, the goal of achieving 100% renewables for all sectors of the economy (electricity, heating and transport) is now official government policy in Denmark.

Partnership working is a key aspect of the proposed changes. Dialogue between political, business, environmental and community groups will improve further as we work to form a common set of goals and priorities. This report sketches out how such a future might be achieved in Herefordshire, as a contribution to current debates about visions for the county. Against a background of ever-increasing energy bills, the time is now right for a revolutionary shift in the county's energy economy.

1, Introduction

The prospect of a future using 100%, or nearly 100%, renewable forms of energy for heat, transport and electricity, is becoming ever more technologically possible, economically desirable and ecologically necessary. This report seeks to sketch out a positive vision for such a future for the county of Herefordshire.²

Herefordshire spends something of the order of half a billion £/year on importing energy (electricity, gas, petrol and oil) into the county for all uses in all sectors of its economy.³ This money leaves the county; virtually none remains to be re-circulated in the local economy. This is a tremendous drain on our economy. Converting the economy of the county to one based on locally owned and controlled renewables is the greatest economic opportunity in the history of the county.

In 2009, according to the most recent data produced by the Department of Energy and Climate Change, Herefordshire had per capita carbon emissions of 8.6 tonnes. This figure has fallen somewhat over recent years, but needs to fall more rapidly to meet Climate Change goals. Also it may be the case that some of this recent fall is due to outsourcing production or a reduction in economic activity due to the recession. The challenge across the UK is to demonstrate that carbon emissions are falling rapidly and consistently over time, irrespective of what is happening in the economy. The figures are challenging. In 1990 Herefordshire emitted 1.7 million tonnes per annum; by 2050 the target is an 80% reduction, which is down to 340,000 tonnes, or an annual reduction of 28,670 tonnes every year for the next 38 years.⁴

A large and growing number of people are in fuel poverty as fuel prices rise. Much of the housing stock is old, drafty and poorly insulated, although recent efforts to improve this should be acknowledged. The current economic recession exacerbates the numbers in fuel poverty. These numbers are deeply concerning. In 2009 32.2% of the population were regarded to be in fuel poverty and this figure will undoubtedly have risen over the last three years as fuel prices have risen substantially during this period, far faster than either the thermal efficiency of the housing stock or average wages.

The question is: could Herefordshire reduce this haemorrhaging of nearly half a billion pounds per annum to zero, or virtually zero? Could we not only meet but exceed carbon reduction goals, and reduce or eliminate the numbers living in fuel poverty? Could all this be achieved while transforming the economy of the county to create sustainable forms of prosperity, creating many thousands of new jobs

and businesses, including a huge diversity of new types of employment, some of which would rejuvenate the agricultural sector? Could we reduce debt and reduce financial risks associated with the global economy by investing heavily in the local green economy? Could we achieve all these desirable economic goals while simultaneously achieving a great number of other desirable social and ecological goals, such as dramatic falls in carbon emissions, increased biodiversity and improved health and wellbeing for the people of Herefordshire? The answer of this author is emphatically YES. Transforming the generation and use of energy within the county is the process on which we can hang these other benefits.

2, Energy After Cheap Oil

The kind of economy we have in Herefordshire, as in the rest of the industrial and industrializing world, has been built during the era of cheap, apparently abundant and seemingly benign fossil fuels. That era is over.⁵ Many experts believe that we now are in the post Peak Oil era. Whilst other commentators oppose that view, it is almost universally agreed that oil prices are likely to rise, erratically but persistently. Climate change means it is increasingly unwise to keep burning fossil-fuels using existing technology. Globally renewable forms of energy are being developed at an exponential rate of growth. To repeat my opening sentence: the prospect of a future using 100%, or nearly 100%, renewable forms of energy for heat, transport and electricity is becoming ever more technologically possible, economically desirable and ecologically necessary.

Many academic works are now being produced which seek to show how various regions, countries or the whole world could move in a similar direction. In the UK context the Centre of Alternative Technology has produced 'Zero Carbon Britain'

and local authors David Olivier and Andy Simmonds have just published 'Less is More'. In the USA the work of Mark Jacobson, Mark Delucchi and Roy Morrison are all of interest, as in the global and European context are many of the reports of the Desertec Foundation and the writings of Gregor Czisch. The evidence base that a 100% renewable energy future is theoretically, practically and beneficially achievable is growing by the day.⁶

Often the best results can be achieved by maximizing energy efficiency. This is particularly the case in the built environment where huge energy savings can be made through good design and construction. The construction of every new building presents us with the opportunity to build radically differently and better. Eco-retrofitting existing properties will reduce fuel poverty, energy bills and carbon emissions while creating many new jobs. Transport, industry, commerce and agriculture, like buildings, can all be redesigned and adapted to fit a lean energy future. By so doing a surprising range of benefits can be realised.

Where renewable energy is being developed and deployed with local ownership and control there are a growing number of examples of places achieving a great diversity of economic, ecological and social benefits simultaneously.

Small towns with large rural hinterlands can generally make the transition to a 100% locally generated renewables based economy, for heating and transport fuels as well as electricity, a lot more easily than larger cities. Many of the most impressive examples so far are from smaller towns and villages, many of which are comparable in size, resource base and possibilities to our county towns.

Bigger towns will find it harder, and the world's mega-cities will almost certainly

remain large importers of energy, even as this mix changes from one based on fossil fuels to one based on renewables.

While we talk about places producing 100% of their energy requirements from local renewables, this must be seen within the context of energy grids getting larger and smarter. At various times electricity is exported and imported to match supply to demand within any locality. Renewables have the problems of intermittence and variability, but these problems are surmountable with better grids and better energy storage. Larger grids are planned to link the Irish, North and Baltic Seas, so offshore wind can be made more dependable. Grids are also planned to link us to Iceland with its geothermal, hydro, wind and marine renewable resources, and to the Sahara with its vast solar resource. These distant sources will be a part of the UK energy mix; just as in windy weather we might export electricity from the North Sea. It will be useful to prioritise the most local, while utilizing more distant sources at times of need, a concept called energy subsidiarity.⁷

Everywhere there will be benefits from developing locally owned and controlled renewables. Many places in continental Europe are perhaps twenty years ahead of anywhere in the UK, and we have much to learn from them, as the following examples demonstrate.

3, Learning from Europe

Many communities across Europe are now making the transition from a fossil-fuel based economy to one based on renewable forms of energy, for heating and transport as well as for electricity. If this renewable energy is locally generated,

owned and controlled, the benefits can be many: economic, social and environmental.

The main motivation for change is usually the need to solve immediate social and economic problems, such as high unemployment or the failure to retain young people in the locality. Carbon reduction targets and other ecological goals are usually seen as catalysts to achieve these wider social and economic outcomes. Perceiving the potential benefits of greater energy autonomy is often the first step. If national and European policy is supportive of change this is of course useful, but the key determinant of success is, in most cases, a forward thinking or even visionary local mayor or council working together with strongly engaged local citizens, businesses and a great diversity of other partner organisations.

In 1992 the small Austrian town of Güssing (with a population of 3,800, roughly equivalent to Bromyard) estimated its outflow of money on imported fossil fuels to be 6 million euros per annum. Over the last 20 years they have reduced this drain on their local economy to virtually zero. They now generate renewable electricity, heating and transport fuels to the value of 15 million euros, with this money almost entirely circulating in the local economy and so creating multiple benefits. Over this 20 year period Güssing has achieved large falls in carbon emissions while achieving impressive economic growth. Peter Vadasz, the long-standing local mayor, has received global recognition for his pioneering leadership in this work.

Güssing can now offer stable fuel prices projected decades into the future, and this is acting as a powerful draw for new businesses and has created over 1,100 new high quality jobs. The local council in Güssing has seen a huge rise in revenue

and now can offer a greatly improved range of services for local people. Unemployment and the out-migration of young people had been a major problem, and the prime driver of change. Now this small town is buzzing with new opportunities and jobs.

Farmers in the Güssing area have found new markets in supplying energy crops to the anaerobic digesters and to the wood chip gasification plant. They are also benefiting from an increase in tourism. Tourists come to see the pioneering renewable-energy projects, the growing white stork population and other indicators of increasing biodiversity due to very good ecological land management. The provision of a very extensive network of rural cycle paths makes it all the more attractive. Making the transition from a wasteful fossil-fuel based economy to an efficient, locally-owned renewables based economy can and does have many economic and ecological advantages for all sectors of society.

Wildpoldsried is a small south Bavarian town of 2,531 people, similar in size and in renewable resource base to Kington in Herefordshire. It now produces over three times more electricity than it consumes, and plans to continue to increase this. A district heat main, well insulated buildings and ecological land and water use practices all help to improve energy efficiency and increase ecological and economic sustainability. Most farmers in the Wildpoldsried area now describe themselves as 'energy farmers' as well as 'farmers', as in many cases most of their income is generated in the energy sector. This tiny town has four locally owned and controlled renewable energy companies which bring in a combined income of over 5 million euros. Over the last 14 years Wildpoldsried has achieved a 65% reduction in carbon emissions at the same time as impressive economic growth.

Wildpoldsried now has a booming economy, with a growing amount of research, development and deployment as academics and companies work with the local community to develop a smart grid, hydrogen production and fuel cell technology so that all these renewables can be integrated into the region's energy systems. New jobs and apprenticeships are improving the prospects of young people wanting to stay in the area. The mayor, Arno Zengerle, has become something of a celebrity as he and Wildpoldsried have won many awards. Wildpoldsried has become a powerful exemplar to other communities seeking to move toward a 100% renewable energy economy.⁸

Frederikshavn is a town with a population of 23,331, situated in the northeast of Jutland in Denmark, which following shipyard closures during the 1980s and 90s was experiencing high unemployment. The town council adopted the motto 'Join the fossil fuel free future: make the green economy grow' as they set about trying to achieve the objective of producing 100% renewable electricity, heating and transport by the target date of 2015.⁹ By 2008 unemployment had fallen to record low levels as renewable energy and energy efficiency projects were initiated. The majority of the town's electricity now comes from wind power, with multiple sources of renewables, including an impressive 8,000 m² solar thermal collector field, feeding into the town's district heating system.

Güssing, Wildpoldsried and Frederikshavn are just three of the most outstanding examples of a phenomenon that is becoming increasingly widespread in much of Europe, and that is the transition from a fossil fuel based economy to one based on renewables. These three, and many others, are all demonstrating the benefits

of massive community involvement through local ownership and control of power generation.

4, Eco-Island Project

There are many other examples of places like Güssing, Wildpoldsried and Frederikshavn, all achieving a broad range of ecological, economic and social benefits as they make the transition from a wasteful fossil-fuel based economy to economies based on big savings through efficiency coupled with locally owned and controlled renewable energy. The most impressive results so far are to be found in mainland Europe, with the rest of the world having isolated examples of success. Nowhere in the UK has gone very far down this path, but the Isle of Wight has perhaps the most exciting plans to do so of any region of the UK, although many others are now in the process of developing broadly similar plans.

The Eco-Island project in the Isle of Wight is an ambitious proposal to transform their economy. They envisage a mix of solar, wind, geothermal and tidal energy utilising hydrogen energy storage. The ambition is to improve a wide range of indicators simultaneously: carbon emissions falling, biodiversity increasing, health improving and the economy growing. They plan to work with a wide range of local, national and global partners including technology companies, universities, the local council and health authorities, media and community groups.¹⁰

5, Eco² Herefordshire (as proposed by Richard Priestley)

The Eco² Herefordshire concept is about creating an ecologically and economically beneficial future for Herefordshire. Global best practice now shows that we can have a prosperous and dynamic economy in the post-fossil-fuel era if we embrace

the necessary changes in a positive can-do manner. Many places are now showing that radically reducing carbon emissions, reducing all forms of pollution and strengthening biodiversity are compatible with a comfortable and prosperous future. Transforming the Herefordshire economy from a wasteful fossil-fuel based past to a smart, energy efficient, renewables based future is both a tremendous challenge and an extraordinary opportunity. Let's rise to the challenge and grasp the opportunity now!

So far this is just an idea in one person's head. Of course many other people are struggling to conceptualise a better future for our county. Some of those people will share many of my ideas. No one person can do very much on such a big agenda. The best model of what I am trying to do is currently the Eco-Island project in the Isle of Wight, where Dave Green had a similar vision for his area and with his colleagues got a number of local organisations to come in as founder partners. They then drew in both national and global supporting and knowledge partners, including the local council, politicians, the press and most importantly universities and technology companies that could lead the transformation of the local economy to one based on a mix of local renewable energy.

I am currently proposing a few provisional goals. For my big idea to work we will need a number of founding partners as they have on the Isle of Wight, and they and others will obviously contribute to the shaping of this vision. This will be an on-going process toward ever greater ecological and economic sustainability. We in Herefordshire have many innovative projects and businesses, and a strong desire in the community: we could be a UK leader in the race towards a radically more sustainable future.

The **Eco² Herefordshire** logo tries to capture the sense of bringing the best ideas, technologies, projects and developments that are now happening in many other places to Herefordshire, and in that sense it is Eco-to-Herefordshire. The Eco² refers to the two words economy and ecology, which both come from the same Greek root 'oikos', meaning management of the household, and in a wider sense of our planetary household. For humanity to overcome the immense threat of climate change the economy that our species has created must be made to fit into the ecological limits necessary for the continued health of a well functioning biosphere. This does not mean going back to some mythical pre-industrial past. This is about a sensible modern economy.

The potential benefits for the county are many: greater economic resilience and greater prosperity, the creation of many thousands of jobs in for example eco-retrofitting buildings, new cleantech and renewable energy businesses, huge reductions in carbon emissions and in other greenhouse gases and pollutants, improved health through the greater physical activity levels and decreased pollutants, increased biodiversity, better soil and water conservation and other changes in land use that can both provide new income streams for farmers while sequestering carbon.

Herefordshire has some tremendous resources, opportunities and possibilities. We have many excellent builders and architects capable of designing and constructing highly energy efficient new buildings and of doing the much needed eco-retrofit of existing structures. We could be at the forefront of designing and implementing radically more efficient, ecologically and economically sustainable transport policies and infrastructure. There are great opportunities for the

farming community to develop new carbon sequestering, fertility-maximizing sustainable and profitable farming methods and to be involved in multiple renewable energy businesses.

Transforming the county's economy will of course not be cheap. A capital investment of perhaps £5 billion may be required to achieve the goal in full.¹¹ As this figure represents only ten years of fuel imports into the county, the payback period would appear remarkably short. This sum would of course not be from a single budget, but spread over perhaps two decades and attract investment from a multitude of stakeholders including local, national and European governmental bodies, local and global businesses, individual householders and perhaps most important of all new local structures such as we see with the Leominster Community Solar Cooperative. Also of course vast amounts of money would be saved as the use of fossil derived fuels would steadily fall, as they are displaced by energy saving and the post-construction cost-free renewable energy.

The first step is to identify some founding partners who are supportive and willing to contribute to the costs of an initial scoping study, to start on a few demonstration projects and to build the kind of partnership working that will be essential in order for the full range of benefits to be maximized. The team assembled by New Leaf for this work for the DECC/LEAF programme is an ideal base from which to grow this process. The remainder of this paper sets out some of the potential building blocks of the [Eco² Herefordshire](#) project.

6, Transforming Energy Use in Herefordshire

Many of the world's leading sustainable energy experts argue that investment should be 75-80% focused on energy efficiency and 20-25% focused on locally

owned and controlled renewable energy generation.¹² Investments in energy saving often have a much quicker pay-back period than investments in energy generation of any kind, and this is likely to become more the case in the future.

In 2010 Herefordshire Council commissioned Wardell Armstrong to write a report on the potential to develop renewable energy in the county. While this report produced much useful data, unfortunately the brief did not include the role of energy savings. Also certain technologies that are as yet not well known in the UK, such as district heat mains, which were not recommended for deployment by Wardell Armstrong as they considered the concentration of heat demand to be insufficient in any one area to justify the expenditure, whereas in, for example Gussing, heat mains are used even in relatively rural areas with considerably less concentrated heat demand. Wardell Armstrong represents a useful first step, but now should be read in the light of the work of Olivier and Simmonds.

Mid Wales is likely to find generating surplus energy relatively easy given its windy ridges, fast flowing streams and rivers and abundant biomass including huge conifer plantations. To the other side of Herefordshire sits the West Midlands conurbation of Birmingham, a place that will long remain a huge importer of energy even in a totally renewably powered future. Herefordshire might just be one of those places in energy balance, generating roughly as much energy as it uses, but only if it takes energy efficiency seriously.

The fact that energy prices are currently thought of as being expensive and are projected to increase significantly over coming decades, should be a useful spur to new thinking. For decades we have had cheap and abundant energy and have become used to wasting prodigious amounts of it. High energy costs are useful in

that they ensure relatively rapid pay-back times on investments in energy saving technologies, and they are a spur to changed behaviour.

Future prosperity for a county such as Herefordshire is absolutely predicated upon very much greater energy efficiency. Planning and implementing a lean energy economy for the county will have significant implications for the local economy. How we plan new settlements, how we build new buildings and how we change existing ones, how we travel, farm and run the county's economy will all need to change in ways that also offer tremendous opportunities.

We will develop a diverse portfolio of renewable energy technologies in the county. Over the last couple of years there has been a tremendous growth in the number of photovoltaic panels, mainly small 2 - 4 KW systems deployed on individual house roofs, but also larger systems on barns, factories and, in the Leominster case, on the roof of the local sports centre. Some field-scale systems, up to 5 MW, may be built. Much depends on the changing rates of feed-in-tariffs, at least in the short term. In the longer term photovoltaic deployment may not be dependent on feed-in-tariff as panel prices are set to continue to fall and conventional energy prices increase, so that perhaps in a decade this may be one of the cheapest options for electricity generation within the county.

Of course solar energy is not confined to photovoltaic panels. Non-electrical use of solar power has even greater potential and with the renewable heat incentive may become a large new local industry. Passive solar gain will increasingly be used in the built environment, combined with good design, high thermal mass and excellent airtightness and insulation to provide warm buildings that require minimal other sources of heating. Solar thermal water heating will provide an

ever greater share of our hot water through individual rooftop panels. Large scale solar thermal arrays on factories, barns, hospitals and other large buildings, and also possibly field-scale installations, can be developed, feeding hot water into a district heat main for space heating and cooling, and hot water for domestic, commercial and industrial customers.

So far Herefordshire has only a few very small wind turbines in operation. Larger turbines are generally much more reliable, more cost effective and efficient.

Currently there is great opposition to any proposed wind turbines. This is often because local people feel incensed that the economic benefits go to a very few already rich individuals (the landowners and power companies) while the vast majority are exposed to possible disbenefits such as falling house prices, noise or the very real visual effects. There is much greater support in other countries where community ownership of wind turbines is the norm and where the local population feel in control of site selection and how the economic returns are distributed. It should perhaps be a condition of the development of wind power in the county that community owned schemes should be strongly prioritised.

Reeves Hill was a classic case in point. Had the community been asked at the outset to work with local landowners to devise a scheme that maximised local benefits there would almost certainly have been much less resistance. Had they known how the people of Fintry in Scotland benefited through their wind turbine they might have felt huge enthusiasm for co-developing the Reeves Hill project.¹³

Anaerobic digesters are gradually being built and have huge scope for increased future deployment. Unfortunately the Leominster Community-owned anaerobic digester has not yet become a reality. In Güssing, and in many other places,

anaerobic digesters are being deployed to huge local economic and ecological benefit. The time is now right to develop community-owned anaerobic digesters. The gas grid will increasingly be fed by renewable gas, as is already the case in Germany and in isolated UK examples such as Didcot.

Many other forms of bioenergy will be developed in the county. The Woolhope Dome Community Wood-Fuel Project is developing woodchip for heat in a pioneering way.¹⁴ The Zero Carbon Britain¹⁵ report envisaged the widespread use of miscanthus or other crops such as short rotation willow, grown specifically for energy production. In future we may see the local deployment of higher-tech uses of wood fuel such as the double fluidised bed gasification process developed by Hermann Hofbauer at Güssing.¹⁶ If Herefordshire benefits from the expertise being developed at EBRI¹⁷ in Birmingham, there is also great potential for the development of algal bioreactors with the cooperation of local farmers, Welsh Water and of course the local community.

Hydro has a useful, if relatively small, potential within the county. In the short term this will mainly be local micro hydro on small streams and rivers, but the possibility exists to develop somewhat larger schemes in the longer term, on the river Wye for example. Again, community-owned schemes can serve as a beneficial way to maximise benefits and minimise opposition.

In tandem with the development of a mixed portfolio of renewable energy systems a range of energy storage systems will be developed both globally and locally. Technology companies are developing renewable hydrogen, biomethane, ammonia, batteries, flywheels, thermal storage for electricity re-generation, pumped storage systems for hydro and chemical phase change processes. The list

is long, complex and potentially lucrative given the tremendous need for energy storage in any energy system that is approaching 100% renewable. All these technologies are currently being developed elsewhere, and one might ask why not in Herefordshire?

METNET (a regional environmental technology network for small businesses) has over 300 members, many located in Herefordshire. There is a lot of pioneering activity already underway in the county and the neighbouring region. Meanwhile, Ludlow-based Shareenergy has experience in developing community-owned renewable energy co-operatives. How can all this expertise be taken to the next level?

7, Economic Challenges & Opportunities

Indebtedness is a problem for many people, businesses and organisations. Meanwhile many people, businesses and organisations, including some with debts, have capital invested in banks, stocks and other financial institutions that are doing nothing positive and beneficial for the locality or humanity in general, and which in many cases seem increasingly risky. This is as much the case in Herefordshire as it is in much of the rest of the world. Herefordshire's dependence on fossil fuels exacerbates indebtedness at all levels within the county. It also makes the county vulnerable in the eventuality of future shocks to the global economy and possible interruptions in supply, or extreme spikes in price, which seem increasingly likely.

Investing heavily in the local green economy has paid tremendous dividends, social, ecological, economic as well as financial, in those places that have done this well. In the Herefordshire context we are at the very beginning of this

process. The community-owned Leominster solar roof raised over £150,000 from 94 investors over a few weeks. Could a thousand similar community owned renewable energy projects be established in the county over the coming decade or so? As the costs of many renewables are falling this would cost considerably less than £150 million, certainly less than what is currently spend on fossil fuels by the county every four months. It would represent a powerful step along the path to energy autonomy. One possible route by which local money could be channelled into such local projects is the Bank of Herefordshire proposed by Councillor Liz Harvey. Direct share offers, as in the Leominster case, will clearly play a major role, and as this share offer was oversubscribed by 40% mainly from local small investors, there is clearly an appetite for such schemes. This week, in early March 2012, the Archenfield and Pomona Solar Cooperatives are both in the process of forming.

Herefordshire has a strongly skewed demographic profile as young people leave the county in search of higher education and better employment prospects. There is a recognition that the county needs to create new opportunities for young people to stay and prosper within the county. Transforming the energy economy of the county will create many new opportunities for businesses, which in turn will create jobs and apprenticeships. There will also be opportunities for new entrepreneurs, for more research to be done within the county and probably also for the development of higher education within the county.

The renewable and cleantech sectors of the global economy are growing rapidly. We in Herefordshire should seek to capitalize on this. This, rather than defence, should in my view be the focus for the new enterprise zone at Rotherwas. The city

of Baoding, led by the inspirational Yu Qun, closed many polluting factories and replaced them with a cleantech industrial zone to great economic and ecological benefit.¹⁸ We in Herefordshire are at a critical time; decisions made in the coming months are likely to affect our future carbon emissions and economic prosperity for decades to come. It should also be noted that as important as the Rotherwas development is, more important still is decentralised employment, close to where people live in the villages and market towns of Herefordshire, and that small businesses are likely to predominate more in the future.

The economic challenges and opportunities will be explored in more detail as we look at how to convert the energy basis of our economy in the subsequent sections of this report on building, transport and agriculture. First we will look at other ecological, health and social goals: it is important that these are not just some kind of add-on to the economic planning, but fundamentally part of the process.

8, Carbon Reduction & Maximizing Diverse Benefits

Herefordshire, UK and a growing proportion of the world now have legally binding carbon reduction goals, currently in the UK based on achieving an 80% reduction in emissions by 2050, from a 1990 baseline. The general direction of policy will probably follow that of the science, with a time lag of a few years as scientific understanding filters through to policy makers. The science now points to the need for more ambitious targets. More challenging objectives are likely to be introduced long before the 2050 deadline. A 100% reduction in emissions by 2050, plus considerable carbon sequestration (effectively meaning a 110% reduction) may soon be the policy objective. Carbon reduction is seldom seen in

itself as a popular policy goal, but coupled with the other benefits that can flow from it, like lower energy bills, warmer homes, lower unemployment and better opportunities for young people, the popularity of the whole package has already proved to be very great.

A careful analysis of what has been achieved in places like Güssing, Wildpoldsried and Frederikshavn, and what is aspired to in the ambitious and exciting plans for the Isle of Wight, shows that a great diversity of ecological, health, social and economic benefits can be linked to carbon reduction targets. These goals can include physical activity through increased walking, cycling, or allotment gardening, all of which have direct carbon reduction and health improvement consequences. The Isle of Wight scheme links in overall health goals and lifestyle changes, such as decreased rates of smoking and smoking-related illness, with the carbon reduction agenda. The Transition Towns movement sees resilience to all manner of future shocks as lying in the strength of community, and there is increasingly strong psychological evidence that feeling a good sense of bonding with friends, neighbours and community is good for our mental health and wellbeing, as well as having the beneficial consequences of decreasing crime and anti-social behaviour.

Managing the countryside and urban areas of Herefordshire to maximise biodiversity, human recreation, community resilience, individual wellbeing, energy production, food production, sustainable forms of economic prosperity could all be achieved simultaneously, and should be driven by carbon reduction targets. It is this much wider, more holistic and ambitious agenda that underpins the [Eco² Herefordshire](#) concept, and other people's visions and aspirations.

9, Energy Efficient Herefordshire: The Built Environment

The current plans for Herefordshire envisage the construction of about sixteen to eighteen thousand new homes in the county over the next couple of decades.

Many local people oppose this. My perspective is that the gross numbers are not the issue, but rather what gets built where, for whom, and why. The need is for affordable housing that is cheap to heat, connected to jobs, transport systems and all else that contributes to a sustainable, resilient, energy efficient lifestyle. There are lots of examples to follow, some of which are the work of local architects and builders.

Springhill Cohousing is a collection of 34 houses and flats in Stroud, designed by Jonathon Hines and his Herefordshire-based architectural practice Architype.¹⁹

This is in many ways a model to follow. The buildings are designed and constructed to be energy efficient and therefore cheap to heat. Much wood is used which helps reduce the embodied energy in their construction and sequesters carbon dioxide. The layout of the development maximises the use of walking and cycling while reducing car use. This helps in many ways, notably in making the place feel very safe for children to play, people to chat and to linger, and for community relations to be built. Shared facilities for communal meals, guest accommodation and other aspects of shared resources are designed to reduce environmental impact while promoting good community relations.

Cohousing is a relatively new concept in Britain, while in places like Denmark it is a well established and rapidly growing movement, because people find these developments to be good places to live. Most of the current wave of cohousing also seeks to be at the cutting edge of good design and construction. In Britain the

Beddington Zero Energy Development, or BedZED, was built in 2000-2002 at Beddington in South London.²⁰ It was a mixed collection of 99 homes and 1,405 square metres of workspace, and was an early pioneer of building to One Planet Living Standards. Lancaster Cohousing is a collection of 41 homes, a range of office and workshop space and lots of shared facilities and resources.²¹ Again the building design and construction seek to be at the cutting edge of good ecological sustainability, while fostering good community relations and maintaining affordability.

Many of the best architects and builders claim that building to these higher standards can be done at no extra cost. Jonathon Hines and Architype built St Luke's Primary in Wolverhampton and achieved BREEAM Excellent rating, very nearly Passivhaus standard, within the normal school new build budget. Lancaster Cohousing will have one very efficient central boiler instead of the 41 they would have needed if each house had its separate boiler, thus saving a considerable amount of money to invest in better insulation and the triple glazed windows, which are relatively standard now in Passive House buildings. With good design and construction, and the right policy frameworks and financial planning, energy efficient housing can be affordable housing, accessible to all. In Herefordshire Mandorla Cohousing is an embryonic group seeking to be the first cohousing project in the county to combine affordability with the very highest standards of new-build design and construction.²² Integrating food production into new housing developments can also be a very useful way of enhancing quality of life while reducing carbon emissions, as has been done in many of the examples above, and should become the norm in future new build projects.

Lars Carlson and Jonathon Hines have plans to build factory-made kit-form houses to Passive House standards. This is a style of construction that allows high standards to be achieved in a very cost efficient manner, and is standard practice in Sweden but not yet in use in Britain. There is also talk of building the new enterprise zone at Rotherwas to Passive House standards. Pembridge-based SEED homes has pioneered a model for building small developments of affordable, energy efficient, timber houses.²³ Here are some excellent opportunities for Herefordshire to be at the cutting edge of UK new build.

It must be stressed how important it is to get new-build right. As has been argued, designing and building to the highest standards of energy efficiency and ecological sustainability does not have to be expensive. It would be a great mistake to continue to build houses that will result in high energy bills, fuel poverty, high carbon emissions and eventual expensive eco-retrofitting. It is much better, and very much cheaper, to get it right at the outset. The construction of every new property within the county should be seen as an opportunity to put Herefordshire on the map, as a place where best practice is the norm.

Eco-retrofitting existing housing will become crucially important as a way of reducing energy bills, fuel poverty and carbon emissions while providing an increasing number of jobs, apprenticeships and new entrepreneurial opportunities. Two one-off eco renovations within the county highlight the possibilities. Local architect Andy Simmonds has renovated and extended a Victorian terraced house in Hereford, in large part to Passive House standards, and has demonstrated that these so called difficult-to-treat houses can be brought up to radically better standards of thermal efficiency. Harold Armitage

undertook the most extraordinary self build project. With quadruple glazing, super-insulation and photovoltaic panels he has made his old 1930s bungalow in Cradley one of the first houses in the county to be a net energy exporter. The house is not connected to the gas mains, does not use oil or electric heating but uses passive solar gain, with the very occasional use of a wood-burning stove in prolonged cold and cloudy weather and with all wood grown on-site. His photovoltaic panels produce considerably more electricity than he and his wife use, so instead of energy bills they receive energy payments. Could this become the norm for houses of the future? Could most of the existing property within the county be eco-renovated to the standards set by these two local examples?

It is quite probable that some will follow the examples set by the likes of Andy Simmonds and Harold Armitage, but many will eco-renoate their properties to less ambitious standards. Much work is currently going on to make relatively small and incremental changes to the existing housing stock. This is to be welcomed and encouraged, and ever more ambitious standards are likely to become the norm as energy prices continue to rise.

10, Energy Efficient Herefordshire: Transport

Transport policies often polarise opinion in Herefordshire, as elsewhere. Whether to build a by-pass or relief road around Hereford has been hotly debated for decades. Some argue for a western route, some for an eastern route, some for an entire ring road and yet others for no road at all. The general attitude for most of the twentieth century was that car use would continue to grow and that we could build ever more roads in order to accommodate this perceived need. Gradually the limitations of this approach have become all too evident.

Road transport has been one of the fastest growing sources of carbon emissions. Importing oil, now that the North Sea is in decline, has meant serious balance of payment problems for the Treasury. Numerous social, health and environmental arguments can be made against an excessively car-based transport system.

The clinching factor against planning for increasing provision for cars may be simple affordability. We may already have passed 'Peak Traffic'. For the last few years car numbers on UK roads have been falling as prices rise. Currently petrol is £1.35p per litre. The general consensus of opinion is that prices will rise erratically but persistently over the coming years. Herefordshire has many people who drive relatively long distances to do low paid work. Sheer economics may force many of us to change jobs and lifestyles. Car use may well decline erratically but persistently in lock-step with rising fuel costs.

Planning to minimize car dependence can have many advantages. We can improve the quality of life, improve health and wellbeing and reduce crime and anti-social behaviour by reducing car use in our urban areas. Copenhagen started systematically to reduce car parking spaces in 1962, and has continued to do so ever since. The former car parks became new spaces for artistic and cultural expression, and a source of great pride and focus for new businesses.

Simultaneously provision for pedestrians, cyclists and public transport was improved, and Copenhagen is now regarded as one of the most pleasant cities to live, in no small part because it is not dominated by the private motor car.

The best new housing developments such as Forge Bank near Lancaster, or Springhill in Stroud, not only focus on making the buildings themselves very energy efficient but are designed to be very safe for people to walk, play and

cycle around, and car access is kept to a minimum. Through good design the new development of Vauban near Freiburg in Germany has managed to get car ownership down to only 19% of households, and this is declining as people realise the diverse benefits of living in a place that is designed for the post-individual car ownership era. Like Copenhagen it is a popular place to live.

Making walking, cycling and public transport feel safe, pleasant and accessible is often a very cost effective way of improving a broad basket of health, wellbeing, economic, traffic congestion and carbon emission indicators simultaneously.

Improving broadband and increasing flexibility with working hours will also reduce the need to travel, especially at busy rush hour times, and thus further diminish the need for more roads. Walking buses and other arrangements to get children walking and cycling to school can be of great benefit with regard to reducing obesity, improving health and reducing traffic congestion.

The car will of course have a future beyond cheap oil. We in Herefordshire are fortunate to have the prospect of early deployment of the locally designed (and hopefully also locally manufactured) Riversimple hydrogen fuel cell cars. They, like other cars at the cutting edge of ecological sustainability are lightweight with a relatively slow upper speed of 50mph. Speed always comes with a high environmental footprint, and travelling more slowly and saving time by travelling less often and less distance is a critical lesson for the future.

One of the most interesting features of the Riversimple model is that instead of selling cars they will only lease them, retaining responsibility for their maintenance. This will help overcome the problem of designed obsolescence, so much a part of the old wasteful fossil economy.

Instead of individual car ownership as the transport norm the dominant model may shift to people walking, cycling and using public transport more, working more flexibly and often at least partly from home. Cars may be used from time to time by members of car sharing clubs, and these cars will increasingly be lightweight electric or hydrogen fuel cell cars. Colwall car sharing club has been running for a few years and St. James and Bartonsham club is just about to launch. Others no doubt will follow.

Planning for and adapting to the era beyond cheap fossil-fuels presents us with many challenges and opportunities. In redesigning our transport systems we can make Herefordshire a better place to live, with better health, less pollution and less carbon emissions and a higher quality of life.

11, Energy Efficient Herefordshire: Agriculture, Food and Farming

Agriculture in Herefordshire faces a future full of tremendous challenges and opportunities. Uncertainties over future climatic conditions and water availability are a grave concern. Farming in Herefordshire also has a range of problems including the lack of opportunities for young people to enter farming, a lack of economic viability of many of the traditional farming methods and the isolation of many farmers struggling to manage on their own.

Our current system of farming in Herefordshire, as in most of the industrialized world, is highly dependent on inputs, mainly oil based, such as fertilizers and tractor fuels, and other finite resources such as phosphates which are deemed to be in short supply. There are two trends emerging. One trend is towards ever greater capital inputs and larger units of production, selling into global markets and increasingly utilizing genetically modified organisms. The other trend is

towards more localised markets, smaller scale units (often organic and increasingly selling directly to consumers via farmers' markets and box schemes). Community-supported agriculture of this type offers great scope for future development. There are a growing number of commentators who argue that for agriculture to reduce its greenhouse gas emissions, reduce its water use, improve long-term soil fertility and become more generally resilient, it must follow the latter path. Colin Tudge argues that the UK needs a million more farmers. These new farmers will need to find new ways to grow and market their crops.

Localisation makes a lot of sense for food and farming. Farmers selling direct to consumers get many benefits, while consumers can get fresher local produce at a reasonable price. There are many examples of community-supported agriculture having a diverse range of benefits, including lowering carbon emissions and improving local health and wellbeing. Will Allen and the Growing Power project in Milwaukee has achieved a remarkable range of benefits through mass community involvement. The Incredible Edible Todmorden project in Lancashire aims to feed Todmorden with food grown within a 5 mile radius of the town and if this is possible in Todmorden, why not in Hereford? Ford Hall Farm in Shropshire is one of the UK's first community land initiatives, where 8,000 investors work with the farmer to develop a very interesting model of community-supported agriculture. This provides another useful lesson in how we in Herefordshire might develop.²⁴

There are tremendous opportunities for Herefordshire farmers to become involved in the new energy economy. Growing energy crops for anaerobic digesters, feeding slurry into algal bio-reactors, locating wind turbines and photovoltaic arrays on the farm, all offer great benefits if done well. Working with

communities is of great importance: in Mid Wales many communities have become divided over the issue of wind turbines. If these schemes had been designed more as they are in Denmark, where the economic returns are spread broadly across the whole community rather than being focused on one or two individual landowners, community relations could have been fostered rather than destroyed.

Soils hold twice as much carbon as all terrestrial vegetation, and as carbon sequestration becomes ever more important in the battle to contain climate change, the farming practices that sequester most carbon may become the focus of agricultural grants and payments. Managing livestock to this end offers great potential as authors such as Graham Harvey have argued, and some local farmers, such as Will Edwards, are doing pioneering work in this area. Greater use of composts, green manures, bio-char, rock dust, no-till, agro-forestry and permaculture all potentially increase sustainable agricultural production, long-term soil fertility, soil and water conservation and carbon sequestration, and all need greater research, development and deployment.

12, Building the Partnerships, Doing the Work

For Herefordshire to gain the widest possible range of benefits as we make the transition to a post fossil-fuel based economy we will need to build strong partnerships between a wide variety of stakeholders. At present the necessary debates are often fragmented. A meeting, or rather an ongoing process, could be organised by the widest possible range of groups. Key players might include the Bulmer Foundation and New Leaf team behind this report, the two local MPs, councillors of all political parties (including the cabinet and the It's Our County,

Green and other opposition groups), business organisations including the Herefordshire Business Board, the Chamber of Commerce, METNET (Marches Environmental Technology Network), the Herefordshire Conservative Business Forum, green groups such as HiTA (Herefordshire in Transition Alliance), Herefordshire Friends of the Earth, nature conservation groups such as the Nature Trust and RSPB, community groups such as Community First, the Third Sector Board and HVOSS (Herefordshire Voluntary Organisations' Support Service), organisations such as Western Power Distribution and Welsh Water with responsibilities for delivering our electricity and water, and various organisations representing food and farming. We should also seek to draw in potential partner organisations that have specific things to offer, such as universities and global technology companies that are developing key renewable energy and smart grid technologies. All these groups need to meet together to discuss the future and to build on the actions already underway to improve the future for the people of Herefordshire. I welcome the invitation from John Jarvis, leader of Herefordshire Council, to contribute to the Herefordshire 2020 Vision process and hope that this report adds to that dialogue.

¹ http://www.decc.gov.uk/en/content/cms/news/pn12_002/pn12_002.aspx

² I and many others have been advocating this for some years. We were often dismissed as hopelessly idealistic. As of March 2012, the goal of achieving 100% renewables for all sectors of the economy is now official government policy in Denmark. It is expected that other countries will follow the Danish lead.

<http://thinkprogress.org/romm/2012/03/27/452736/all-of-the-above-energy-policy-denmark-commitment-100-renewable-energy-by-2050>

³ This figure is a 'back of the envelope' estimate. (It includes electricity, oil and gas used within the county, but not the embodied energy in materials such as cement, fertilizers and consumer products.) Pete Linnell initially worked out the £500,000,000 figure. I then tried to verify or to disprove the figure by cross checking with various people and using various methodologies, and the consensus was that the figure was broadly correct.. I have asked the

Chamber of Commerce and Herefordshire Council. Perhaps surprisingly neither organisation, as far as I can ascertain, had ever tried to calculate an overall figure. If anyone has done a proper calculation both Pete Linnell and I should be grateful to see the figures. Many factors will influence the overall figure: a cold winter, an economic upturn, or poor planning decisions could all increase the figures, in the short, medium or longer term. Whatever the figure is, the probability is that it will increase dramatically now we are in the post Peak Oil era, if we do not systematically plan energy savings and the conversion of the economy to renewables. (In the few months since we first started using this figure energy prices have continued to rise.)

⁴ This figure assumes the target of 80% reduction by 2050 is the correct goal. The latest science strongly suggests a much more ambitious target is necessary to avert climatic catastrophe: 100% plus considerable sequestration, so effectively a 110% reduction by 2050.

⁵ Even the IEA, who for many years refused to consider Peak Oil, now acknowledge that conventional oils peaked in 2006. <http://www.energybulletin.net/stories/2010-11-11/iea-acknowledges-peak-oil>

⁶ The following are just the tip of the iceberg; there are of course thousands more works I could cite, but these are some of most interesting and influential.

Zero Carbon Britain <http://www.zerocarbonbritain.com/>

Olivier and Simmonds, Less is More <http://aecb.net/news/wp-content/uploads/2012/02/LessIsMore-03.02.12-V1.0.pdf>

Jacobson & Delucchi <http://www.scientificamerican.com/article.cfm?id=a-path-to-sustainable-energy-by-2030>

Roy Morrison <http://www.ecocivilizationweebly.com/building-an-efficient-renewable-grid-op-ed.html>

Desertec <http://www.desertec.org/>

Gregor Czisch <http://blogs.ft.com/energy-source/2010/07/13/gregor-czisch-on-the-super-grid/#axzz1oWKoylzn>

⁷ A term coined by Herbert Girardet and Miguel Mendonca in 'A Renewable World' 2009, Green Books

⁸ <http://www.cipra.org/en/alpmedia/news-en/3886>

⁹ <http://en.wikipedia.org/wiki/Frederikshavn> and

http://www.energycity.dk/fundanemt/files/Chapter_Sustainable_Towns_v5.pdf

¹⁰ <http://www.eco-island.org/hub/eco-tv> Dave Green, the founder and CEO on their TV channel

<http://www.eco-island.org/hub/eco-valley> partner organisations

<http://www.itm-power.com/page/62/EcoIsland.html> hydrogen and energy

http://www.eco-island.org/assets/docs/20111028_ecoisland_charter.pdf Eco-Island charter

<http://www.eco-island.org/hub/vision> Eco-Island vision

http://www.edie.net/news/news_story.asp?src=nl&id=21309 press article

¹¹ Again this figure is no more than a back of the envelope guesstimate, and again, if anyone has done the calculation I would like to see their figures. Obviously estimates will vary enormously, the variables are many and there is no well trodden path to follow.

¹² As a member of the Claverton Energy Discussion Group I follow the email comments of several hundred of the world's leading authorities on this. This ratio I've heard from many people, notably Roy Morrison, Director, Office for Sustainability, Southern New Hampshire University, USA.

¹³ <http://www.fintrydt.org.uk/> and my previous recommendations

http://www.herefordshirenewleaf.org.uk/sites/www.herefordshirenewleaf.org.uk/files/30%20inspirations%20%2030%20suggestions%20v4doc%20_2_0.pdf

¹⁴ <http://www.shareenergy.coop/woolhope/about/>

¹⁵ <http://www.zerocarbonbritain.com/>

¹⁶ <http://en.wikipedia.org/wiki/G%C3%BCssing>

¹⁷ <http://www1.aston.ac.uk/ebri/>

¹⁸ <http://insideclimatenews.org/news/20090603/how-china-spreading-word-about-going-low-carbon> and

<http://www.csmonitor.com/Innovation/Energy/2009/0810/how-baoding-china-becomes-world-s-first-carbon-positive-city>

¹⁹ <http://www.architype.co.uk/projects>

²⁰ <http://en.wikipedia.org/wiki/BedZED>

²¹ <http://www.lancastercohousing.org.uk/>

²² <http://www.cohousing.org.uk/new-group-herefordshire-mandorla-cohousing>

²³ <http://www.seedhomes.co.uk/>

²⁴ <http://www.growingpower.org/> and <http://www.incredible-edible-todmorden.co.uk/> and
<http://www.fordhallfarm.com/index.php>