The rise of renewable energy

Alex Blackburne, March 2012

blue&green tomorrow

"We are like tenant farmers chopping down the fence around our house for fuel when we should be using Nature's inexhaustible sources of energy — sun, wind and tide."

Thomas Edison, 1931

About Blue & Green Tomorrow

Essential intelligence on sustainable investing and living

Blue & Green Tomorrow wants innovative businesses that balance the needs of the planet, its people and our prosperity to grow.

We aim to provide our readers with the knowledge they need make informed choices without prejudice, scaremongering or greenwash.

We want the world to be as blue and green tomorrow as it was yesterday.
We believe that everyone can play a part and anyone can make a difference. Not by going back through misplaced nostalgia to some bygone age, but by striding out to a bright new future in which we take advantage of the new approaches that can improve our quality of life, the food we eat, the air we breathe, the water we drink and the land we live on.

Life is for living without costing the earth.

There is no plan(et) B.

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Contents

Foreword

Can we continue to keep burning dirty fossil fuels at ever increasing rates around the world? The simple truth is: not if we want our blue and green planet to exist for healthy generations to come.

That renewable energy, in whatever form it may take, should be at the heart of our economic strategy for the future is an understatement. It was saddening to listen to George Osborne's 2012 Budget Statement only to discover that renewable energy has somewhat slipped off the agenda to be replaced by financial support for renewed oil and gas discovery in the North Sea. When will we learn that long-term sustainability for the planet and its people must be placed firmly ahead of short-term prosperity?

In "The Rise of Renewable Energy", Alex Blackburne listens to a number of leading voices within the sector to ascertain why the Government, and a percentage of the public, don't fully understand the potential of an essentially limitless supply of clean energy. Looking back through time, we discover that successfully using nature's resources is in no way a new concept. The use of renewable biomass was mankind's first foray into the potential energy that can be unlocked from the things around us.

The issue of nuclear power, which is the subject of much current debate following the Fukushima disaster, is also briefly addressed. Given the enormity of the topic, it will be a subject that *Blue & Green Tomorrow* covers fully in a future in depth report.

Alex provides a very compelling argument for increased investment and support in the renewable sector and leaves me feeling very positive about the future of UK energy security, if only we all embrace what is around us and accept that it directly addresses two of the greatest modern threats to humanity: climate change and the health impacts of pollution.

Rich Whitworth, Editor, *Blue & Green Tomorrow*

Executive summary

Climate change is upon us. The effects are there for everyone to see: melting ice-caps, increasing temperatures, rising sea levels and more pollution. If we continue to pump more harmful gases into the atmosphere, the effects could become devastating and irreversible.

Blue & Green Tomorrow's in-depth report into renewable energy explores the whole landscape. From the humble beginnings of the industry to the current increasingly prosperous sector to what the future has in store for renewable energy. Additionally, the report analyses the top technologies in the sector by interviewing several industry experts:

· Adam Bell of RenewableUK – the trade and professional body and self-proclaimed "voice of wind and marine energy".

· John Constable of The Renewable Energy Foundation – a registered charity keen on promoting sustainable development.

· Gaynor Hartnell and Paul Thompson of The Renewable Energy Association – an organisation that "represents the UK's renewable energy industry, covering renewable power, heat and transport".

· Ed Gill of Good Energy – the UK's first 100% renewable electricity supplier.

· Neil McNiven of REUK.com – a website covering all aspects of renewable energy.

Special thanks goes to Tricia Wiley, Mike Landy and James Beard at The Renewable Energy Association, Jonathan Johns at Climate Change Matters, Sophie Bailey at Good Energy, and Caroline Dempster at Heriot-Watt University.

Each section of the report – the past, the present and the future – explores the world-changing possibilities of renewable energy. Using the respected voices above, we discover where the UK stands in relation to some of the leading lights in the sector – namely Germany, Iceland, New Zealand, Denmark and the US. These countries have all realised the potential of their natural geography to harness renewable power on a large scale. The North Sea (the 'Saudi Arabia of renewable energy') and the Pennines are just two examples of UK resources that could be harnessed to propel us amongst the world leaders in the sector.

Renewable energy is beautiful. From large scale wind farms to household solar panels, sustainably producing clean energy is a striking concept and, more importantly, good for the planet. "The beauty of renewables is that each technology has its own diverse characteristics", said Paul Thompson of the Renewable Energy Association.

It is important not to intimidate people with jargon and figures; "Making the market as transparent and as easy to understand as possible is the best way to keep attracting attention", said Ed Gill of 100% renewable electricity provider, Good Energy. Such transparency will ensure a wider audience base and make the switch to renewable energy more appealing.

Our industry experts comment on the future of the thriving sector, which saw investments worth nearly $200 billion in 2010, and $260 billion in 2011. And the figure is set to rise further, to $400 billion by 2020, according to a Bloomberg New Energy Finance (BNEF) report in November last year. In December, BNEF announced that the trillionth dollar had been invested in clean technology since 2004. In the UK, though, the 'big six' – EDF Energy, npower, SSE, Centrica (trading as British or Scottish Gas), E.ON and Scottish

Power – currently have a monopoly on the UK electricity sector, with a combined market share of over 80%, a stranglehold that may need to be broken.

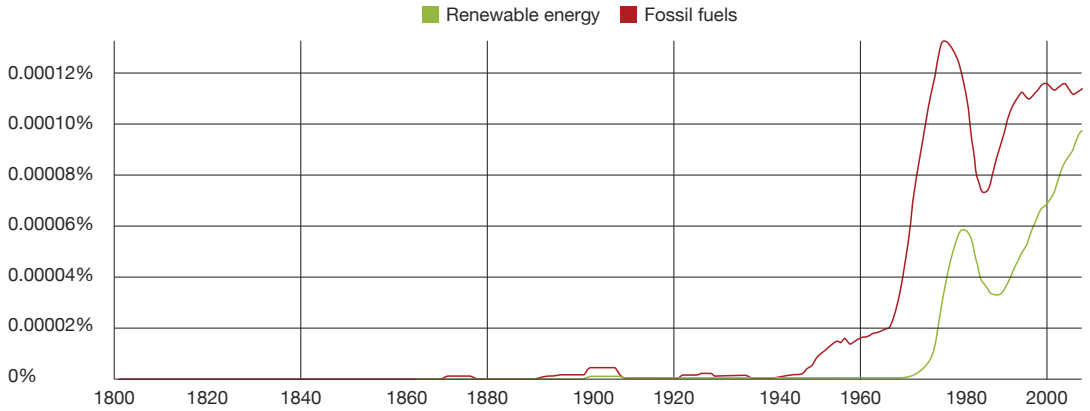
A gradual, large-scale move towards renewable energy is vital and, what's more, it is possible if everyone plays a part. *Blue & Green Tomorrow*'s report invites you to discover various ways you can make a massive difference.

The humble beginnings of renewable energy

An introduction to renewables

Renewable energy isn't a new thing. Before mankind was civilised, the Earth's natural sources – wind, water and the sun – were used to provide power. And while we've seen a considerable shift in priorities in the past 20 years or so, with renewable energies now high on governmental agendas, we still have a long way to go.

This Google Ngram chart shows that, barring a brief spike around the turn of the 20th century, interest in the phrases 'renewable energy' or 'fossil fuels' didn't really exist in literature prior to the 1970s.



A larger spike occurred in 1980, a direct result of the 1979 energy crisis, before a sudden drop in coverage and steady rejuvenation ever since. However, writing about renewable energy and implementing it are two very different animals.

"Renewable energy was the mainstay of the global economy until the mid to late 1700s" – John Constable, Renewable Energy Foundation (REF).

Renewable energy: not as new as you might think

Biomass

Biomass is the conversion of chemical energy of recently living organisms into heat or light energy; traditional forms contribute a large proportion of global energy demand. Biomass use dates back to 400,000BC, when prehistoric humans relied on fire for heat and light. Mastering the use of this gift was the key to our early existence.

Hydro

Current hydro energy generation occurs mainly through the installation of hydroelectric dams, but its origins are quite different. Water wheels were popular forms of powering machines two thousand years ago. They were primarily used to power the milling of flour, but are still used today around the world, for example in Nepal and India. There are two main types; undershot waterwheels sit in a pool of fast moving water, whilst overshot wheels lie beneath a stream of falling water.

Wave

Wave power is the utilisation of ocean waves to harness energy. Power is usually extracted by devices affected by motion on the surface. The technology dates back to the 18th century, with France often cited as early pioneers. Girard (1799) and Bochaux (1910) are two Parisians who tried to drive progress, but it is still a relatively unpopular form of energy because of intermittency issues.

Tidal

Tidal power is the most scarcely used form of water-based energy production. Although more predictable than wind or solar, it is the least cost efficient of all renewable energies, forcing hydro and wave power above it in the pecking order. Strong tides are needed for tidal power to reach its full potential, as underwater turbines are powered by the current. Weak tides make for poor energy production.

Wind

As humans became more educated, we started seeing the greater potential of natural resources. Ships are the earliest man-made forms of long distance transport and for six thousand years, they have been powered by the wind. Heron of Alexandria, a Greek mathematician and engineer who was around in the 1st century AD, is credited with coming up with the first wind powered machine – "Heron's organ included a small windwheel, which powered a piston and forced air through the organ pipes, creating sounds and tweets, 'like the sound of a flute'", writes Experiment-Resources.com. Fast forward to the present day, and wind energy is primarily exploited by large turbines.

Solar

In 1839, a small laboratory in Paris was the setting for 19-year-old French physicist Edmond Becquerel to discover the photovoltaic (PV) effect whilst experimenting with electrolysis. Right in the thick of the industrial revolution, Becquerel's discovery, in which he observed an electrical current on a metal strip that had a bright light focused on it, paved the way for solar power generation as we know it today. However, it wasn't until almost 50 years later that the effect was further developed, with the patent of the first solar cell issued in the 1880s.

Solar PV is still finding its feet in society, but it's a growing industry, complete with many interesting innovations and ground-breaking possibilities. Along with wind power, many see it as the future of renewable energy. Germany is one of the world leaders in solar power, with the country's hugely successful feed-in tariff (FiT) scheme the major reason behind its success. The UK has a similar scheme, but the Government has recently come under scrutiny after announcing slashes to subsidies, though these cuts have subsequently been deemed "legally flawed" by the High Court. The Government has been desperately fighting ever since, despite acknowledging the need for renewable energy advancement.

Geothermal

Geothermal energy, or energy derived from the heat inside the Earth, has its origins in Boise, Idaho. For it is here where the first geothermal heating district opened in 1892. However, it wasn't used to produce electricity until 1904,when Italian scientists first used the technique to power a generator. In 1977, the Department of Energy (now the Department of Energy and Climate Change) embarked on a £50m deep geothermal project that ran for 14 years. Despite advancements in knowledge from the research, it wasn't cost effective.

The DECC predict that as much as 2% of the UK's energy generation could potentially come from geothermal power in the south west of England alone. Further afield, Iceland is arguably the world leader in geothermal energy, mainly because of the ideal climate and geography. The country's abundance of volcanoes allows it to derive over a quarter of its energy share from geothermal sources.

Historical summary

John Constable, director at the Renewable Energy Foundation, describes the misconceptions surrounding the industry's early stages. "Renewable energy was the mainstay of the global economy until the mid to late 1700s", he said. "It is part of the rhetoric of the modern renewables industry that they are in some sense a new departure; on the contrary, it is a return, some would say an unsustainable regression, to the use of low density energy sources."

Adam Bell, communications manager at RenewableUK, says the reason for an increase in commercial renewable energy use is caused by "a combination of rising fossil fuel prices and public pressure around environmental issues, leading to the Government putting appropriate policy frameworks in place."

A remarkable one trillion dollars has been invested in clean energy since 2004 according to figures released by Bloomberg New Energy Finance (BNEF) in December last year. $260 billion was invested in 2011 alone, with BNEF predicting that the figure will more than double to £400 billion by 2020.

It wasn't until the 1990s that the UK began to develop so-called 'new' renewables –wind, biomass and landfill gas. "The motive for supporting them was threefold; to improve energy security, as part of an industrial policy (jobs and exports) and to reduce carbon emissions", explained Gaynor Hartnell, chief executive of the Renewable Energy Association. "Over time, renewables have come to be viewed solely through the lens of carbon saving."

The current state of renewable energy

The UK is still lagging behind

Many countries have recently laid out their plans to become wholly renewably sourced in the future. Denmark, for example, hopes to be 100% renewable by 2050, whilst Scotland and Germany have similar targets. Some call the plans ambitious while other see them as encouraging. Whichever side of the fence you sit on, the fact remains, an increased focus on renewable technology is imperative. And the UK is still lagging behind.

> "Harnessing the renewable capabilities of the UK's physical geography would propel it alongside other renewable energy world leaders."

The very windy and wavy group of small islands that make up the UK is gifted with natural resources. Indeed, the North Sea has been dubbed as the 'Saudi Arabia of renewable energy' for its potential in both wind and wave energy generation. We also boast the Pennines – a natural mountainous spine that runs right through the heart of the North of England, making it the perfect location for solar or wind projects. Harnessing the renewable capabilities of our physical geography would propel us alongside the likes of Iceland – world leaders in geothermal energy because of its abundance of volcanoes – and New Zealand – one of the largest exporters of hydropower on the planet.

Across Europe, there is a prevalent connection between the number of green energy jobs made available and the resultant turnover and power production. It's a simple formula. Countries like Germany, Sweden, Latvia and Denmark have a significant number of people employed across the renewable energy industry, but at the same time, reap encouraging revenue from doing so. Figures released by the European Commission in February state that there were one million people employed in the sector in the EU in 2010. The UK contributed just over 31,000, but this amount will have undoubtedly risen given a further year of growth in the wind and solar industries.

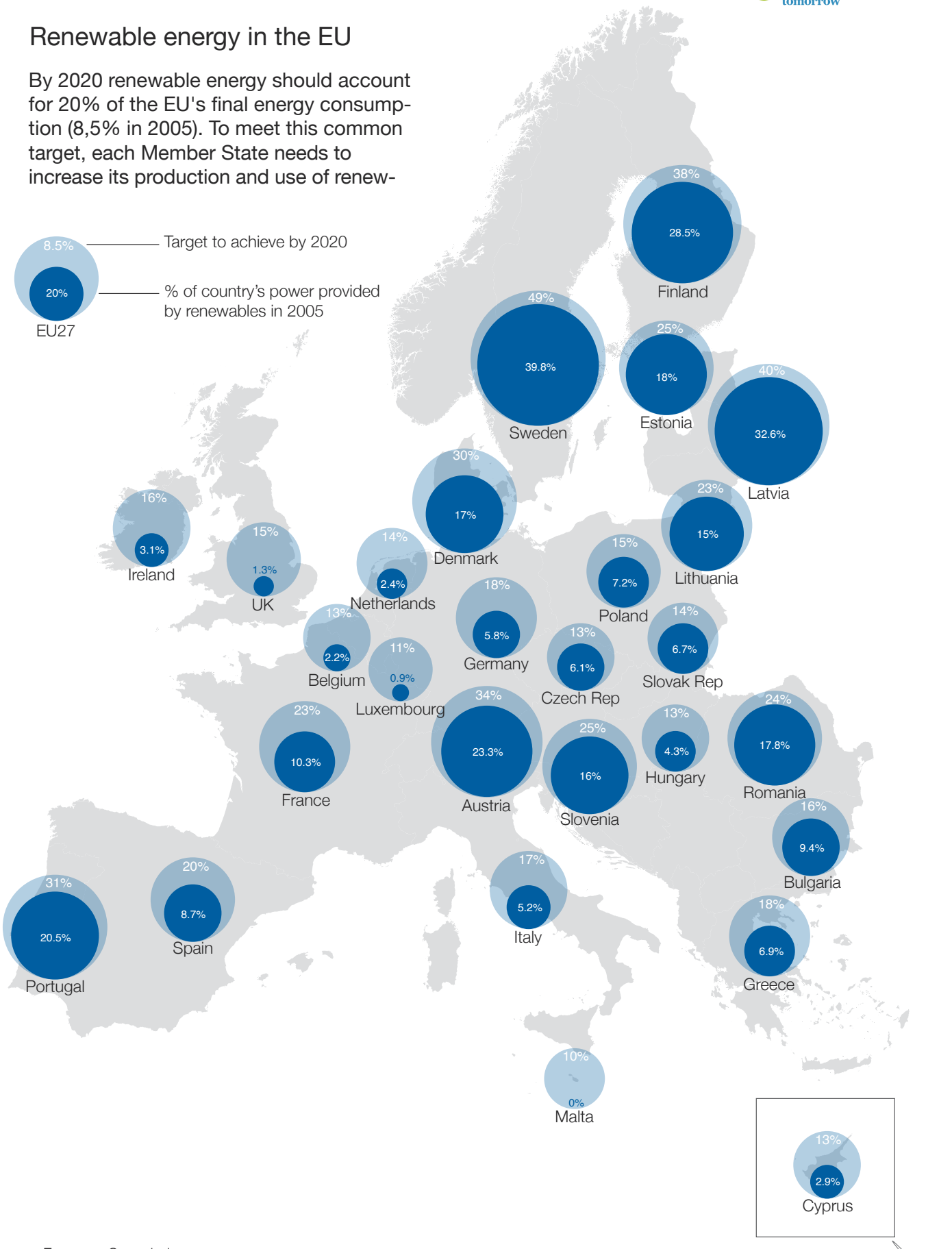
In an attempt to reach out to more individuals, the UK Government devised a feed-in tariff (FiT) scheme, whereby renewable energy producers could receive incentives for installing solar panels. But, in October last year, it announced cuts that halved the subsidies given to solar supporters. This decision was met with great anger by the industry, with many claiming that thousands of jobs could be lost because of the decreased incentive. However, after a legal challenge from environmental group, Friends of the Earth, and solar providers, HomeSun and Solarcentury, the proposed cuts were deemed "legally flawed" by the High Court. The Government responded aggressively to this ruling, and finally appealed to the Supreme Court.

The infographic on the following page highlights renewable energy usage and 2020 targets for several EU countries.

The UK, despite being the third richest country in Europe, is a long way behind. Just 1.3% of its total energy mix was renewably-sourced in 2005. This figure more than doubled in the following five years – to 3.3% in 2010 – and continued to rise,

Renewable energy in the EU

By 2020 renewable energy should account for 20% of the EU's final energy consumption (8,5% in 2005). To meet this common target, each Member State needs to increase its production and use of renew-



Source: European Commission

with renewables contributing record levels in 2011. The chart below shows the most recent UK fuel mix.

Gaynor Hartnell believes we need to see strong governmental action for the UK to reach its 15% renewable target by 2020:

"The government needs to act now to build the investor confidence required to really pick up the pace in the latter half of the decade", she said. "[However], we are leaders when it comes to some of our policies – the world's first Renewable Heat Incentive being a prime example. This is something that others in Europe may well wish to emulate, which is another reason why it is so important that it is implemented well."

Instead of languishing behind the rest of Europe, does this mean the UK wants to become a 'world leader' in renewable energy? With one of the best wind resources in Europe, and some of the best wave and tidal potential in the world, Adam Bell thinks so.

"It would be a mistake to not capitalise on these tremendous natural resources, and in doing so build a world-beating industry. Achieving this will require Government commitment and significant levels of investment, which will only be unlocked if investors have certainty that the framework for supporting renewable energy development will be robust in the long term."

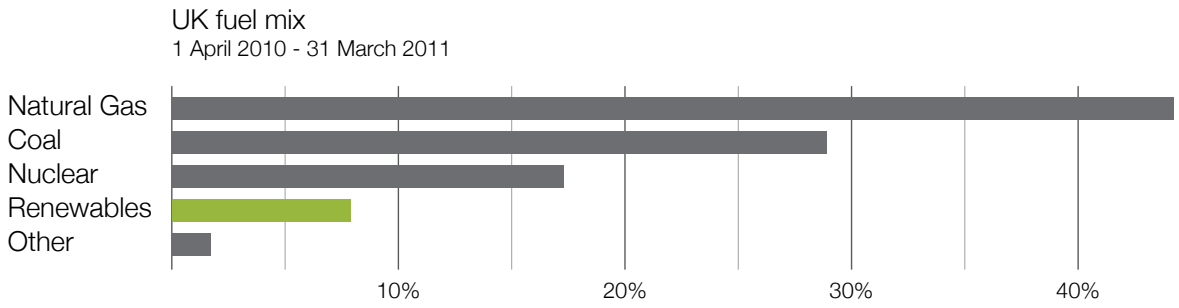
A foundation made for the anti-wind newspapers

Despite working for the Renewable Energy Foundation (REF), which you would justified in believing supported the industry by its name, John Constable disagrees with the idea of the UK leading the field.

"It is a narcissistic folly to believe that we can deliberately lead by example in anything. The only example worth following is that of a successful and prosperous economy, and our current programs for renewables are not economically compelling."

The REF is notoriously pessimistic about most renewable energies, and has therefore handled significant criticism, not only because of its "misleading" name. In an article in Business Green, Dale Vince, founder of Ecotricity, said, "They are not a Foundation for Renewable Energy, as their name says and as any reasonable person would conclude from their name – they actually exist to undermine Renewable Energy. It's made for the anti-wind newspapers of course, like the Daily Mail and the Telegraph, who can quote from this organisation that appears, from their very name, to be all about supporting Renewable energy – adding weight to their anti-wind stance in print."

"The problem with the REF is that their name is misleading", said Juliet Davenport, chief



Source: DECC Fuel Mix Disclosure

executive of 100% renewable electricity firm, Good Energy, who was also quoted by Business Green. “Although they claim to support small-scale renewable generation, what they are really about is trying to block larger-scale wind farms. But if the UK is going to hit our renewables targets, we need both micro-generation and large-scale development as well.”

The ‘big six’ monopoly

Currently, the UK’s energy market is firmly under the throttlehold of the ‘big six’: EDF Energy, npower, SSE, Centrica (trading as British or Scottish Gas), E.ON and Scottish Power. All have recently been accused of unethical behaviour adding to their harmful reliance on fossil fuels. Over 80% of the UK’s electricity and 38.7% of its gas comes from the six providers. For most, convenience and ease drive the decision to pay money hand over fist to the ‘big six’ rather than more sustainable alternatives. But those alternatives do exist and they are breaking the mould in a very positive way. Take Good Energy for example, the only UK provider supplying 100% renewable energy.

> “Making the market as transparent and as easy to understand as possible is the best way to keep attracting attention” – Ed Gill, Good Energy.

Adam Bell of RenewableUK explained that all providers were expected to adhere to renewable guidelines:

“The policy framework that supports renewable energy in the UK, the Renewables Obligation, places a requirement upon all suppliers, including the ‘big six’, to source a certain percentage of their electricity from renewable sources. Suppliers prove they’ve met their obligation by providing Ofgem (the Office of Gas and Electricity Markets) with a certain amount of Renewables Obligation Certificates (ROCs), which are issued by renewable generators in line with the amount of electricity they produce.”

The Renewables Obligation encourages renewable investment. Ed Gill is head of external affairs at Good Energy. He said that even the ‘big six’ recognise that they will fall back in the long run.

“For too long their business models have been built around sweating the existing carbon-intensive energy infrastructure to create profits, rather than saving to invest in a new generation of renewables. That’s why many have had to enter into partnership arrangements with independent investors to build new offshore wind developments. Making the market as transparent and as easy to understand as possible is the best way to keep attracting that attention.”

A wholly renewable planet

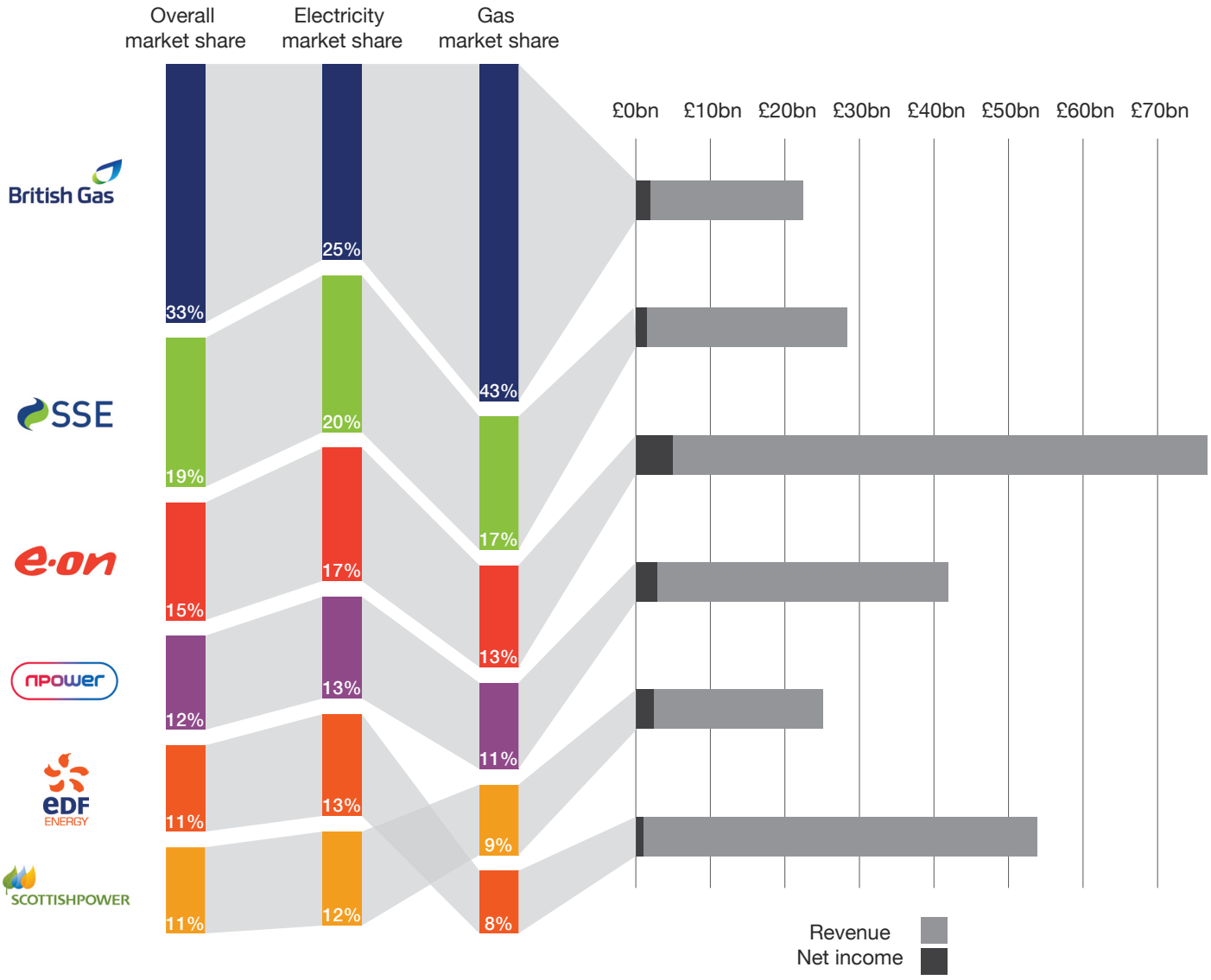
Although the percentage of renewably-sourced energy in the UK is increasing, John Constable of the Renewable Energy Foundation stated that sudden, wholesale conversions to renewable energy wouldn’t work.

“There is no way [that] a densely populated industrialised economy can find a way of turning renewable with current technology, except at the cost of a sharp decline in standard of living and an increase in mortality at every age.”

A spokesperson from Heriot-Watt University in Edinburgh, an institution that offers undergraduate and postgraduate study into renewable energy engineering, agreed that it wasn’t a case of simply switching solely to renewable power sources.

“Energy self-sufficiency at the scale of individual households (generation and storage mechanisms) is a long way off, mainly due to challenges on the storage

The 'Big Six' breakdown



Source: Ofgem, August 2010

Source: Nationwide Utilities

Company	Est.	Headquarters	Ownership
British Gas	1997	Windsor, UK	Centrica
SSE	1998	Perth, UK	Scottish and Southern Energy
E.ON	2000	Dusseldorf, Germany	E.ON AG
npower	1931	Essen, Germany	RWE AG
EDF Energy	1946	London, UK	Électricité de France SA
Scottish Power	1990	Bilbao, Spain	Iberdrola SA

side", they said. "So for foreseeable future we'll be relying on big providers – be it [the 'big six'] or whoever – to help everyone through the times when it isn't windy or sunny."

Energy storage technologies are waiting to be unleashed

Therein pops up another issue – renewable energy storage. Alternative energy – particularly wind and solar – can be intermittent by its very nature. Whilst we know there will be sun and wind somewhere in the world, we can't be certain that we'll be able to completely rely on it for power. This means that most renewable resources have to be backed up by fossil fuel driven energy, just in case. But, as *Blue & Green Tomorrow* reported in December, energy storage technologies have already been developed – they are just waiting to be unleashed commercially.

The nuclear issue

Arguably the most controversial form of alternative energy, nuclear power, currently contributes to around a sixth of the UK's electricity supply. Whether or not it is classed as renewable is widely-discussed, and the deliberation over its use is even greater. On the plus side, a single plant can generate power at the same rate as fossil fuels.

On the other hand, storage of its radioactive waste is beyond difficult given that it must be stored for 10,000 years to ensure full safety according to US Environmental Protection Agency standards. To put that into context, Stonehenge is at best 5,000 years old; no man-made structure from 10,000 years ago still stands today, meaning that we must build something more stable and protective than man has ever built.

Then there's the matter of nuclear proliferation. The West cannot be hypocritical forever. If the entire world is going to harness nuclear energy, it will most likely lead to the presence of nuclear weapons in volatile countries. In the 2010 documentary film, Countdown to Zero, the President of Iran, Mahmoud Ahmadinejad said something to the effect of, "If it's ok for the West to have nuclear power, then why isn't it ok for Iran?" He's right. If the UK begins to commercially invest in more nuclear power generators, then other countries have every right to do the same.

The nuclear disaster of Fukushima has certainly given some countries pause for thought, not least Germany who reacted with a political decision to decommission all of its nuclear power plants by 2022, replacing the output lost with renewable energy sources.

Despite its negative points and because of its lack of carbon emissions and great potential in energy production rates, we may have to bite the bullet. *B&GT* will be following innovations in nuclear power generation, such as those seen in China with the use of thorium, very closely indeed.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What the future holds for renewable energy

Renewables industry is "growing apace"

An increased reliance on renewable energy is imperative, if we are going to truly tackle climate change to realise a blue and green tomorrow. And while many believe that embracing renewable energy is the future, John Constable stated that a "sudden collapse" in the renewables industry is "inevitable" – a view that Gaynor Hartnell said was "not widespread".

"A recent business confidence survey revealed that confidence in the industry is actually growing apace", she said, "in spite of the current lack of faith in Government commitment to green policies. In fact, as fossil fuel prices continue to rise, as supply of foreign fuels becomes more volatile, and as technology maturation continues to lower the costs of renewables, there is only good reason to believe that better, not bleaker, times lie ahead for renewables."

Similarly, Adam Bell irrefutably denied Constable's claim:

"The industries we represent are certainly in no danger of collapse", he ensured. "We've already installed 5.7 GW of wind turbines in the UK, both onshore and offshore, and have government targets of around 30 GW installed by 2020. There are plenty of opportunities in the sector as we move towards this ambitious goal, and the Government's recent announcement of reforms to the electricity market to support low-carbon is a step in the right direction for the certainty required to attract the investment needed to meet those targets."

Constable maintained his cynical stance, saying that "only the tempering fires of real world competition will deliver a viable renewables industry." He did say, however, "I suspect that this will tend to be for niche applications only, but the possibility of a wholly unexpected breakthrough can never be ruled out."

> "Some people talk about the clean energy economy as if it's a hypothetical future development, but the fact is that it's already here and poised for tremendous growth in the coming years" – John Schueler, US Department of Energy.

The rise of a sustainable revolution

The industrial and information revolutions are now history, but are we on the verge of a sustainable revolution? Bell called the prospect "inevitable" as "the price of unsustainable energy sources continues to rise". However, Neil McNiven, owner of REUK.co.uk, a website covering all aspects of renewable energy, believes that evolution rather than revolution is the word, stating "unless we suddenly run out of oil, coal, and gas – something which is not going to happen […] there will be a continuing of the current evolution toward sustainability as the cost of fossil fuels increases and the cost of renewable energy tech goes down".

Hartnell, along with Paul Thompson, head of policy at the Renewable Energy Association, argued that "the logic of sustainability is difficult to argue with.

"Even the staunchest environmental sceptics cannot ignore the simple fact that a resource will run out if it is consumed faster than it is replenished", they said. "Renewables, by definition, have higher rates of replenishment than of consumption, whether that energy comes from the sun directly, or indirectly, via wind, wave, or photosynthetic storage in biomass."

The future of the UK industry

RenewableUK's Adam Bell commented on what the UK's near term goals were in terms of renewable energy:

"Our targets for 2020 are to have a thriving offshore wind turbine manufacturing industry in coastal areas around the UK, employing tens of thousands of people. We'll have three times the number of onshore wind farms we currently have, and many more offshore farms, covering significant areas of the seas around Britain. The wave and tidal industry will be reaching commercial scale, with the first large-scale tidal farms in place in the waters off our coasts."

At the crux of the issue is climate change. If we maintain our heavy reliance on fossil fuels, we will fail to reduce carbon emissions, a crucial step in reversing the damage that has already been done. However, with more infrastructure and increased levels of investment for clean energy, the climate change tide can be turned. That said, some researchers believe we may already be past the tipping point, in which case, the emphasis will shift to adaptation and geoengineering. Either way, renewable energy is a big part of our future.

The facts are out there for everyone to see. Films such as The Age of Stupid (2009) and An Inconvenient Truth (2006) bring the issue of global warming to the big screen. And Ben Goldsmith, the environmental entrepreneur, chillingly told *Blue & Green Tomorrow* that "there's no business to be done on a dead planet".

Aims, targets and policies

So, what can you do?

"There are plenty of opportunities to develop community renewable energy projects", said Bell. "These range from biomass combined heat and power (CHPs) engines in tower blocks, solar panels on school buildings [and] micro-hydro plants in old mills, right through to owning your own wind turbine."

He refers to a resource produced by the Centre for Sustainable Energy, called Plan Local, "which guides communities and individuals through the steps they'll need to develop their own renewable energy sources." There is also a report by Climate Change Matters Limited, The Big Society and Renewables, which gives individuals more information about sustainability at a community level.

There is a continual need to develop more advanced renewable technologies, which is easier said than done. One way to speed up the process is by increasing education in the intrinsic underlying principles of the sector.

> "The reality is that an energy system based on fossil-fuels is simply not sustainable – by definition there is only a finite supply, which will eventually run out" – Ed Gill, Good Energy.

Heriot-Watt University in Edinburgh offer renewable energy engineering courses at both an undergraduate and postgraduate level. A spokesperson from the institution labelled the courses as "vitally important" in the attempt to bolster companies researching, manufacturing and operating sustainable energy sources. Heriot-Watt said the courses "inspire creative young people to take the next big intellectual leap in these directions". They also said they

have faith that the human race will deliver the necessary technologies for our planet to prosper in the future: “There is an incredible amount of natural energy sloshing around the planet. Humans are pretty good at engineering solutions, especially when our backs are against the wall”.

Neil McNiven of REUK.com, said, “Going into the future, the big change will probably be national grids merging together into super grids so that we could get solar electricity from North Africa to Northern Europe for example.” The Desertec initiative, which sees massive solar farms installed in deserts to power Europe, has been billed as one of the most promising renewable energy schemes to have ever been developed.

“Other than that”, McNiven continued, “Renewable energy technology will continue to develop, getting better and generating electricity more and more cheaply, which will make it more attractive spurring further growth and development.”

Tackling the renewable energy naysayers

There are still sceptics in the sector who claim renewable energy is unproductive. John Constable agrees and says “the sceptics are right […] is a spoilt child industry that badly needs to be exposed to the cold winds of the real world”.
Good Energy’s Ed Gill answered the critics. “All too often scepticism of renewables is misplaced”, he claimed. “The reality is that an energy system based on fossil-fuels is simply not sustainable – by definition there is only a finite supply, which will eventually run out. As that supply begins to decline, we will all have to bear the rising cost of fuel prices. That won’t just affect the pound in our pocket; it will also impact on the wider economy by introducing greater financial instability for businesses and organisations, potentially undermining investment planning and growth. Using renewables to meet our energy needs can offer a way out of those problems.”

The future of the Earth depends on the decisions we make now. A future without renewable energy is not only fearfully unsustainable, it is one without people or prosperity. We must harness the natural energy around us to secure a future for our children.

In an article for the US Energy Department, John Schueler wrote, “Some people talk about the clean energy economy as if it’s a hypothetical future development, but the fact is that it’s already here and poised for tremendous growth in the coming years”. That’s a key point; today, we are seeing just a mere glint of what the renewable industry can achieve tomorrow.

The beauty of renewable power

The wind power sector, in particular, has received criticism from cynics who have branded the turbines as “ugly”. It is understandable that some people are blind to the aesthetic beauty of the individual structures, but does not their importance to the future of the Earth make them some of the most beautiful constructions on the planet? Plains of turbines churning out endless clean energy is a dream that can be turned into reality. Paul Thompson of the Renewable Energy Association highlighted the wondrous potential buzzing around the renewables sector.

“The beauty of renewables is that each technology has its own diverse characteristics”, he said. “With the appropriate infrastructural support, these technologies complement each other. Some provide steady baseload power while others kick in when needed. A renewable energy future is the only option once the coal, oil, gas and uranium run out. It is our choice how we get there, with booms and busts, or on a steady, controlled glide path.”

The renewable energy industry is an exciting sector, with a wealth of innovation and investment opportunities surrounding it. The UK may have been left behind during the initial boom in the technology, but many now acknowledge that it is the only path towards a sustainable future.

As Barack Obama said to Congress in 2009, "To truly transform our economy, protect our security, and save our planet from the ravages of climate change, we need to ultimately make clean, renewable energy the profitable kind of energy."

You can act today by making the switch to renewable energy at your business or home; Good Energy is currently the only provider of 100% renewable energy. Take a look at The Rough Guide to Community Energy for more information on how your local area can become renewable; the full book is available online. You can also write to your MP in an attempt to force action at a local level.

Conclusion

The contributors to *Blue & Green Tomorrow*'s Rise of Renewable Energy report, stand firmly behind a clear message: renewable energy is the key to a sustainable future. Furthermore, it is evident that investment in renewable technologies at a community level not only raises awareness but also puts the solution in the hands of the people who will benefit.

Sceptics who claim that renewable technologies lack in efficiency will not disappear, but there is a growing and broader multitude countering that the alternatives are not only unacceptable, they are also economically and environmentally unsustainable. Investment funds increased knowledge, and increased knowledge leads to innovation and increased efficiency. Such a virtuous cycle can only lead to a positive outcome.

Perhaps the biggest repost to any remaining scepticism attempting to stifle progress in the sector is to describe the future of our little blue and green planet of tomorrow with and without renewable energy.

Without renewable energy, fossil fuels will continue to pollute the air, with associated deaths from the health impacts increasing to disturbing levels. Without renewable energy, our inability to stave off climate change will raise sea levels making millions homeless, contribute to global water shortages and negatively affect biodiversity. At the same time, the rapidly rising population's energy demands will drive the cost of coal, oil and gas to unsustainable levels and destabilise the global economy.

With renewable energy, we support a fresh and innovative industry, secure our long-term energy supply, create jobs, and reduce pollution. With renewable energy, we protect our beautiful planet and its people.

Glossary of terms

Baseload
The permanent minimum load that a power supply system is required to deliver.*

'Big six'
The market leaders in UK energy: EDF Energy, npower, SSE, Centrica (trading as British or Scottish Gas), E.ON and Scottish Power. All energy from these is primarily sourced from non-renewable sources.

Biomass
The conversion of chemical energy in recently living organisms into heat or light energy.

DECC
Department for Energy and Climate Change

Electrolysis
Chemical decomposition produced by passing an electric current through a liquid or solution containing ions.*

Energy
Power derived from the utilization of physical or chemical resources, especially to provide light and heat or to work machines.*

Feed-in Tariff (FiT)
A scheme in which renewable energy users are paid for the power they generate sustainably.

Fossil fuel
A natural fuel such as coal or gas, formed in the geological past from the remains of living organisms.*

Geothermal
Relating to or produced by the internal heat of the earth.*

Greenhouse gas
A gas that contributes to the greenhouse effect by absorbing infrared radiation. Carbon dioxide and chlorofluorocarbons are examples of greenhouse gases.*

Hydroelectric (hydro power)
Relating to or denoting the generation of electricity using flowing water (typically from a reservoir held behind a dam or barrage) to drive a turbine which powers a generator.*

Nuclear power
Electric or motive power generated by a nuclear reactor.*

Photovoltaic (PV)
Relating to the production of electric current at the junction of two substances exposed to light.*

Renewable Heat Incentive (RHI)
A scheme by the UK Government to provide financial support to emerging technologies and businesses to reduce dependence on fossil fuel heating and emission.

Renewables (renewable energy)
A source of energy that is not depleted by use, such as water, wind, or solar power. *

Renewables Obligation (RO)
An obligation under which electricity providers must prove to source a certain proportion of energy from renewable sources.

Renewables Obligation Certificates (ROCs)
Certificates given to eligible renewable generators for every MWh of electricity generated.

Solar cell
A device converting solar radiation into electricity.*

Solar panel
A panel designed to absorb the sun's rays as a source of energy for generating electricity or heating.*

Solar power
Power obtained by harnessing the energy of the sun's rays.*

Sustainability
Conserving an ecological balance by avoiding depletion of natural resources.*

Wind power
Power obtained by harnessing the energy of the wind.*

Wind turbine
A turbine having a large vaned wheel rotated by the wind to generate electricity.*

*denotes Oxford Dictionaries definition [http://oxforddictionaries.com/]

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Beyond renewable energy

We believe you can make a difference in four simple ways:

Energy

Domestic energy use accounts for just under a third of all energy use in the UK (Energy Savings Trust). Switching to a clean green alternative not only means you'll be reducing pollution but providing valuable investment for this emerging industry. And possibly saving money at the same time. Very few companies provide 100% renewable energy but you can switch to one on our website.

Shopping

Shopping seems trivial at times, but is central to our everyday lives. Making the big decision to shop ethically causes less harm to the environment and fights against exploitation of people and animals. It's actually easier than you think to shop ethically without compromising on cost or quality. To help you navigate the heroes and villains of retail, visit any one of the guides highlighted on our website.

Travelling

For decades, the notion of jetting off to far-flung climes and experiencing foreign cultures was seen as a great way to broaden your horizons – figuratively as well as literally – and improve your outlook on the planet as a whole. As global warming and pollution became pressing issues, unneccessary travel was deemed wasteful and contrary to the aims of the green movement. Thankfully, eco-tourism fills the void as it directly supports local regional economies while striving to have a minimal negative impact on the destination or on the environment during the journey. Our website lists some of the independent tour operators that the industry body (AITO) holds up as best in class for sustainable tourism.

Investing

You want to grow, protect, enjoy and pass on your wealth. Whatever your circumstances, very few mainstream financial products promoted in the national press will meet your needs.

A growing number of investors back social, ethical or environmental enterprises, or choose to avoid investing in companies that are doing the most harm. This is also known as socially responsible investing or ethical investing.

Navigating sustainable investment can be challenging and our website provides access to local, qualified and independent financial advisers who can help you build a portfolio that will balance your financial needs and thoughts on sustainability. You can also take a look at our directory of ethical financial advisers on the following pages.

Ethical IFA Directory

BARCHESTER GREEN INVESTMENT

Firm: Barchester Green
Coverage: Wiltshire
Contact: Bernard Lovesey, Tim Bradford or Andrew Faulkner
Address: Barchester House
45-49 Catherine Street
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Firm: Stewart Investment Planning
Coverage: Bristol & North Somerset
Contact: Martin Stewart

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Firm: Smythe & Walter chartered financial planners
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