



Greenbang
Clean-tech and business news

The UK Clean Tech Start-up Company Index 2008



Dan Ilett
Editor-in-Chief
Greenbang



Dear reader

This report profiles some of the UK's best new companies in the clean tech industry. If nothing else, I hope it illustrates that some of the ideas and business models are simply inspiring. I challenge you not to find the same in at least one of the companies we have included.

It's been fascinating to see Greenbang grow from a blog written from my bedroom/office last year, to where it is today, attracting 80,000 readers a month to the website written by a team of five journalists.

On a daily basis, Greenbang follows innovation, sustainable business and clean technology stories that might contain the odd answer to some of the problems we face today.

But for this report, we wanted to dig deeper and take a snap shot of how the UK stands up in the global market of clean tech. We also wanted to find UK innovators' views on the industry and discover how they see humankind moving away from a dependency on oil.

Unfortunately, we also found some of these companies look likely to move abroad with their talents because the UK investment environment is failing to cater for clean tech companies, which say they can easily find the money overseas.

I hope this report can help to change that.

At Greenbang, we're always looking to meet people, as this is such a new industry. So if you don't know us or we don't know you, drop us a line some time.

Dan Ilett
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Simon Bond
Innovation Centre Director
University of Bath



I'm delighted to support Greenbang's UK Clean Tech Start-up Company Index 2008.

It is a field of particular interest to the University of Bath as, based on our strong international reputation for research expertise in this area, the University will launch a new research Institute for Sustainable Energy and the Environment (I-SEE) later this year.

The new institute will bring together researchers from across the disciplines to establish an integrated understanding of the relationship between technological systems, social practices, human behaviour and sustainability with the aim of meeting the challenges of climate change and the need to secure a low carbon economy.

The University's Innovation Centre provides business incubation along with access to investors and commercial networks and we are looking forward to working on the many commercial opportunities that are likely to emerge from the I-SEE.

The Innovation Centre also works on equal terms with commercial opportunities from outside the University and we are excited about the potential to collaborate with Clean tech companies on incubation and the commercial exploitation of our research as activity in this crucial sector continues to grow.

Simon Bond

the **INNOVATION** centre
for entrepreneurs

Amanda Groty
Head of Technology Practice, EMEA
Hill and Knowlton

It has been a great pleasure to support Greenbang in producing this report on the UK's Clean Tech Start-ups in 2008.

Start-up businesses have particular communications needs and within this group, clean tech start-ups face specific challenges.

At Hill & Knowlton, we know how to reach the stakeholder communities with which these early-stage companies interact. We have expertise in working with all these groups; from government and regulatory bodies to venture capital firms. We help our clients gain exposure in the media and influence other equally important individuals and groups who have an impact on the success of each company.



Clean tech firms must pay attention to the risks and opportunities at all points of their evolution and value chain. Targeted communications can help preserve the integrity and reputation of these fast growing companies, paving the way for their future sustainable growth.

The rapid growth of the clean technology sector and the considerable innovation within it can deliver tremendous benefit for both business and the planet as a whole. Moreover, traditional IT models are helping researchers discover new ways for other sectors to generate, store and distribute energy, not just conserve it.

The tech sector is, therefore, finding ways to make sustainability a profitable exercise for everybody, not just a necessity.

The companies in this report are trailblazers, young firms that lead the way in their field of specialisation. H&K is proud to sponsor this report that looks at the companies who are making sustainability a profitable reality.

Amanda Groty joined Hill and Knowlton in 2002 and currently heads H&K's EMEA technology practice, supporting clients affected by energy, environmentally driven purchasing policies and the desire to build a sustainable business in a sustainable world.



"Clean tech is a term used to describe knowledge-based products or services that improve operational performance, productivity, or efficiency while reducing costs, inputs, energy consumption, waste, or pollution. Its origin is the increased consumer, regulatory and industry interest in clean forms of energy generation - specifically, perhaps, the rise in awareness of global warming and the impact on the natural environment from the burning of fossil fuels."

Source: Wikipedia

The UK Clean Tech Start-up Company Index 2008

Introduction

Take one planet. Add a rising human population. Stir in a food crisis, a growing dependence on fossil fuels and devices that feed off them. Whisk in some fears of energy security, price hikes, and sprinkle with some shrinking supplies of oil. Add a lot of carbon and cook for 50 years.

It's not exactly a recipe for success...

There's much work to be done to slow or perhaps reverse the effects of this mess. We at Greenbang look at the business, technology and innovation approach to answering just a few of these problems.

There has been an explosion in alternative energy technologies and green business that has kicked off the clean tech revolution. A report by the United Nations Environment Programme says that investment in energy-efficiency technology reached a record \$1.8 billion in 2007, a 78 percent increase on 2006.



The main drivers for this impressive growth are: climate change is real and business and society know it - so being green is cool (at the moment). At the same time energy

prices are soaring, yet businesses still need to be profitable, so that means cutting costs while increasing sales. As a result, people are looking for technologies that cut energy bills, on economic and ecological grounds.

Looking forward, the demand to make the world a cleaner place isn't slowing. By 2020, the sector will be worth over \$600 billion, says the UNEP. Meanwhile global temperatures and fossil-fuel prices show no signs of cooling so investment in innovative startups will be crucial to cleaning up our recipe for disaster set out above.

Producing this report

We wanted a snap shot of the industry in the UK before looking at other countries. Assessing the health of this industry has highlighted some fantastic opportunities but major potential downfalls.

We published a call for submissions from clean tech start-ups on our website (greenbang.com). To qualify, the company had to be less than two-years old; be privately owned (i.e. not publically listed); have a strategic path to profit or be an obvious target for investment; and sell a product or service with a clear environmental benefit (that was hard to measure as in many cases there is no standard process for this, so we have offered our opinion).

Some of this was a bit of a tall order. There was also some confusion around the definition of start-up, which we would like to point out does not simply equal 'idea'. It soon became clear that the less-than-two-years criterion ruled out a lot of companies of substance. By this we mean companies with a solid revenue pipeline, some kind of infrastructure, a website (so many companies we looked at didn't have one) and so on.

Granted, a lot of companies probably won't have backing after just two years. There are exceptions: DeepStream Technologies secured £2.8 million in venture capital the year it launched.

That said, we decided to extend the age of qualifying companies to five years, to show the growth trajectory from start-up to substance and the lessons to be learned from that. After searching the country and putting out feelers to a wide range of contacts, our list of UK clean tech start-ups began to take shape. The shortlist...



The most difficult part of compiling this report was narrowing the shortlist. Clean tech spans a cross-section of industries as diverse as companies making waves in marine energy generation, to those who design pipelines inspired by the movement of blood-flow.

And even within individual sectors there were a number of issues to get to grips with. There is, for example, a difference between wave energy and tidal energy – but more on that later.

Although these companies fall into our categories – carbon, construction, energy, resources, technology and transport – many fall into more than one area. And we didn't want to hamper the chances of any company by putting a label on them now. So we put them in alphabetical order.

We found original, inspiring designs, technologies, business models and people who have worked hard every day to build a business in this sector. The UK has some incredible up-and-coming businesses that are ripe for a closer look. The disclaimer comes next - this is not the definitive list. This is Greenbang's opinion and an informed selection. There may have been some companies that slipped through the net. But then again, that's their fault for not reading our website, and for failing to produce their own.

And finally...

We'd like to thank the University of Bath's Innovation Centre, and PR company Hill & Knowlton for sponsoring this report.

Thanks to those who worked on this report: Pamela Whitby, Jo Best, Ewan MacLeod, Krystal London, Lisa Kwok and Dan Ilett

And of course, massive thanks to everyone who took part.



What we found

It would have been a wasted opportunity to talk to so many bright minds without recording their opinions and experiences.

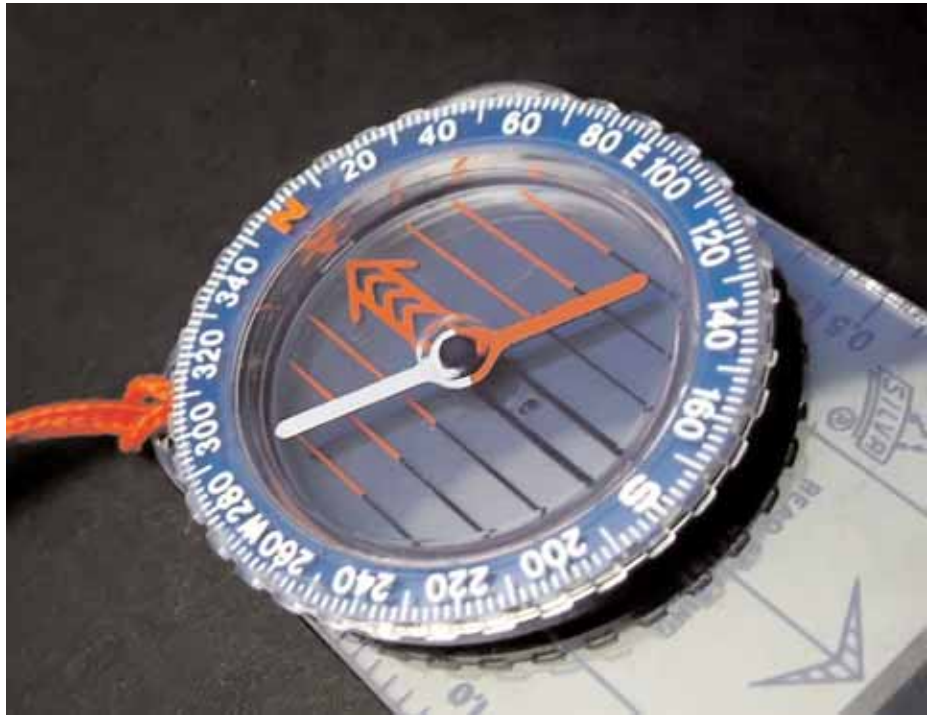
We've headlined the major findings from interviews with our selected start-up companies:

- If the UK doesn't buck up its ideas, great technologies will move offshore where it is easier to get investment
- Political and regulatory uncertainty is a significant risk and deterrent for investors
- The hike in the price of traditional energy sources, coupled with the increasingly environmentally savvy consumer is changing the way people think
- Alternative energy is the future but what carbon footprint does it leave?
- The cost of renewable energy is falling as oil costs are rising
- Energy security is essential – another driver for looking at alternatives
- Transparency around new technology is key – otherwise we risk another bio fuel drama
- Getting seed capital from investors seems straightforward but moving products from the prototype phase is tricky
- Corporate and social responsibility is important to shareholders
- At the same time there are rising costs for business as a result of oil price hikes, resource shortages etc.
- Carbon trading will become increasingly important

Green, clean or just to be seen?

Our companies gave us some wonderful insight into how the clean tech sector looks today and could unfold over the coming years. For starters, they said companies will have to do more than pay lip service to being 'green', a term some think will be out of the window before long.

Many big businesses leapt on the green bandwagon early, making a marketing meal out of becoming 'environmentally friendly'. Certainly using green credentials as a marketing tool has been effective. After all, as Marks & Spencer has shown, it can do a power of PR good.



So far, so good, but consumers are wising up. They want to see companies going further. Not only are there increasingly clear links between corporate responsibility and profitability, there's also greater awareness and scepticism on the part of consumers.

Young businesses are tackling this by taking the green message to the core of their business. Older companies are fighting back with corporate responsibility sections in their annual report to shareholders.

"If you are going to be a green company, you have a serious obligation to educate the next generation," says Robert M. Hertzberg, chairman of solar energy company G24 Innovations, which is building an environmental learning centre.

This new wave of consumer awareness is inspiring a need for greater transparency - renewable energy may be the future but what about the impact of drilling a great big lump of metal into the sea floor? Creating a renewable oil alternative is one thing, it's quite another if that leads to massive food shortages.

"We have seen biofuels go from the status of hero to zero in the UK media," says diesel converter Regenatex's director Mike Lawton. "Those companies that show the most positive transparency with respect to social and environmental impact will be the leaders."

What is the government doing to help start-ups?

Government policy and support, or lack thereof, will have a huge impact on the future of clean tech. The Kyoto agreement, for example, made cutting carbon a must-do rather than a nice-to-have.



The UK's target is to lower greenhouse gas emissions 12.5 percent below 1990 levels by the end of 2012 - but the UK wants to go further than that, cutting carbon dioxide emissions by between 26 and 32 percent by 2020. With that in mind, the government is falling over itself to sanction the introduction of taxes, regulation or legislation to reduce car emissions, make homes carbon neu-

tral and so on.

But is the government doing enough of the right things quickly enough? If the companies on this list are anything to go by, the answer is 'no'. When asked how difficult it was to establish a business in the UK, the responses ranged from "quite easy" (Flybrid) to "extraordinarily difficult" (G24i).

Weighing up the risk

Most of our start-up companies say central government could do more to make investors less risk-averse in the UK. Government policy makes it difficult for start-ups to make the jump to production, says cooking-oil refiner Proper Oils - although there is silver lining in that it equally acts as a barrier to competitors too. Government could also place greater emphasis on promoting local production and supply, handy for buyers as well as sellers given the rocketing oil prices.

Longer-term policies are also needed to make sure regulatory and political risk doesn't deter investors.

"We need some long-term stability so that investors feel reassured that the next election won't remove support mechanism or destroy a market opportunity," says Regenerate's Mike Lawton. A good example of how long-term policies work is solar power in Germany: one of the cloudier countries in Europe has an impressive solar industry, due to an unwavering backing from the country's government.



Local support for local people

Many companies have found support from councils cuddling up to green technologies. QuietRevolution has benefited from a local authority requirement to have green energy on-site and both the Welsh Assembly and Cardiff backed DeepStream Technologies and G24i. DeepStream received £1.2m in funding over three years, based on its ability to create a certain number of jobs in the local area.

Brains and brawn

The UK's universities, coupled with help from some government departments, are providing an encouraging environment for many clean tech players. The UK does well in research and development: most universities have an innovation division, for example. Imperial College's development department, Imperial Innovations, brings in commercially minded people not academics to give its start-up companies a healthy push.

The inventor of the Thermofluidics pump, Thomas Smith, believes this could be taken further with more incubator wings for the start-ups to shelter under.

“What is needed to bring about a boom of successful new clean-tech start-ups is a super-incubator scheme,” he says, to provide workspace as well as advice, experienced management support, head-hunters, lawyers, accountants, bookkeepers, technicians and so on. Ideally, inventors end up free to be creative while safe in the knowledge that the commercial side of the business is under control.

Show us the money – or we’re going abroad



This brings us to the thorny issue of funding. For some companies securing angel finance was relatively straightforward. Certainly the establishment of bodies like the government-funded Carbon Trust has been a lifeline to many small businesses. Low-energy ventilation company e-stack, for example, applied for funding through the Carbon Trust’s applied research scheme.

For every happy tale, there’s a story of struggle where companies “have to bang the door down and be incredibly persistent to be heard. “That is in stark contrast to the governments of South Korea, Canada, Scotland, Norway and Iceland which regularly get in touch to explore development, manufacturing and installation prospects,” says one of our respondents.

The UK might lead the way in wave-energy research but it could risk its current advantage to overseas enthusiasm, which wouldn’t be the first time that’s happened...

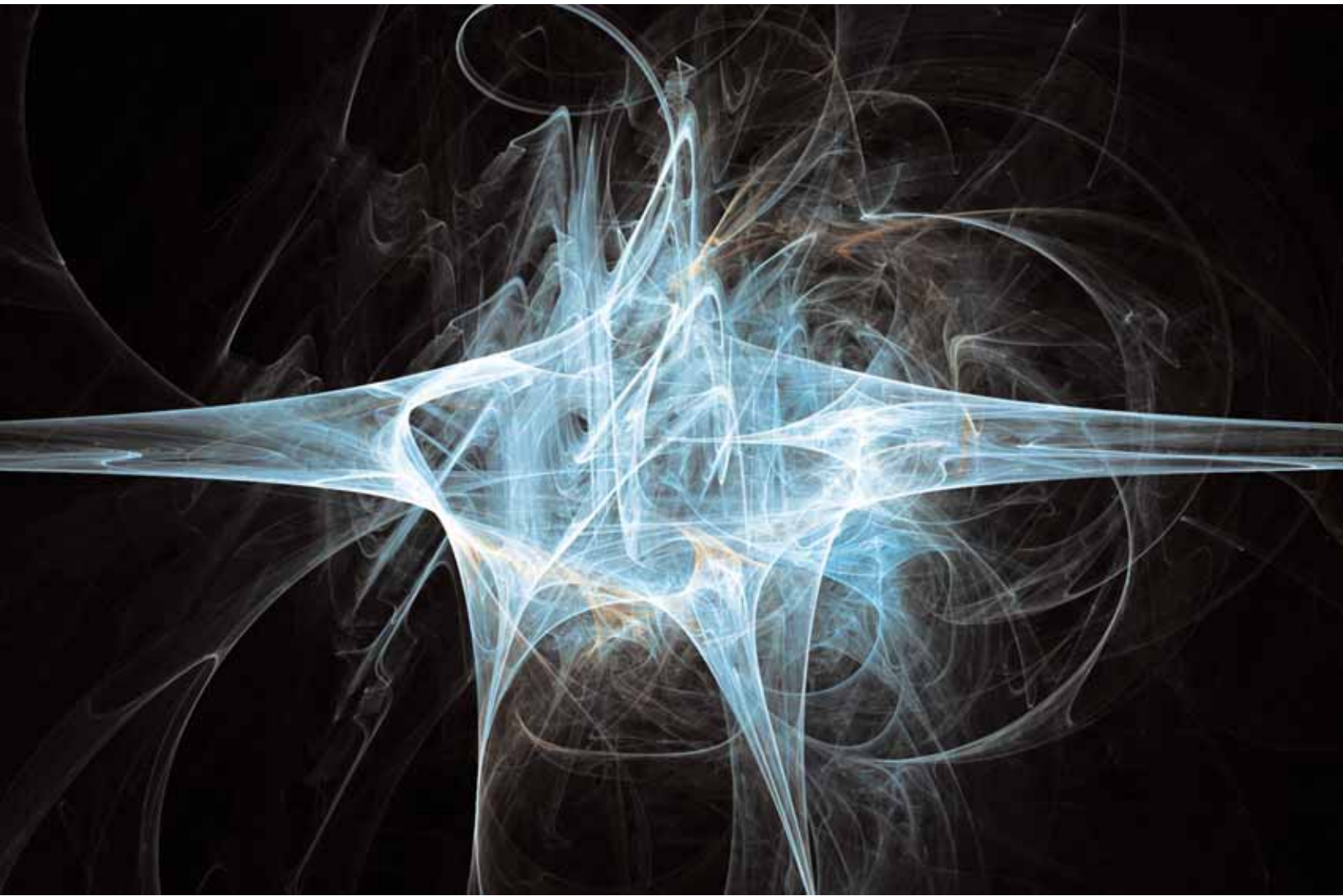
Solar energy companies too, like Quantasol, say there is little government support or knowledge of solar energy. It’s a bit of a worry - the high capital expenditure required to switch electricity to renewable energy is putting off enterprises, despite the long-term savings. If government doesn’t believe in it, why should business?

Want to boost your size?

Clearly the government needs to speak up and intervene – to help start-ups progress to mid-size through better conditions for investors. And to help mainstream companies make the move to using clean technologies less painful.

This brings Greenbang to another financial headache - the messy issue of second-level funding. It's the type of funding businesses really need to make the transition from start-up to substance. Grants for research, development and the all-important deployment are conspicuous by their absence in the UK. There are plenty of options around for research and development but all that does is get a company to the laboratory demonstration phase - and it's a big, expensive leap from here to commercial deployment.

As a result we wouldn't rule out the start of consolidation in the sector. Bigger companies snapping up smaller start-ups with sound technology may be the only way forward, with mergers also helping to create those all-important economies of scale. Regeneratec's merger with CleanStar Energy of India, a company that is cultivating non-edible oil-bearing trees, is a good example.

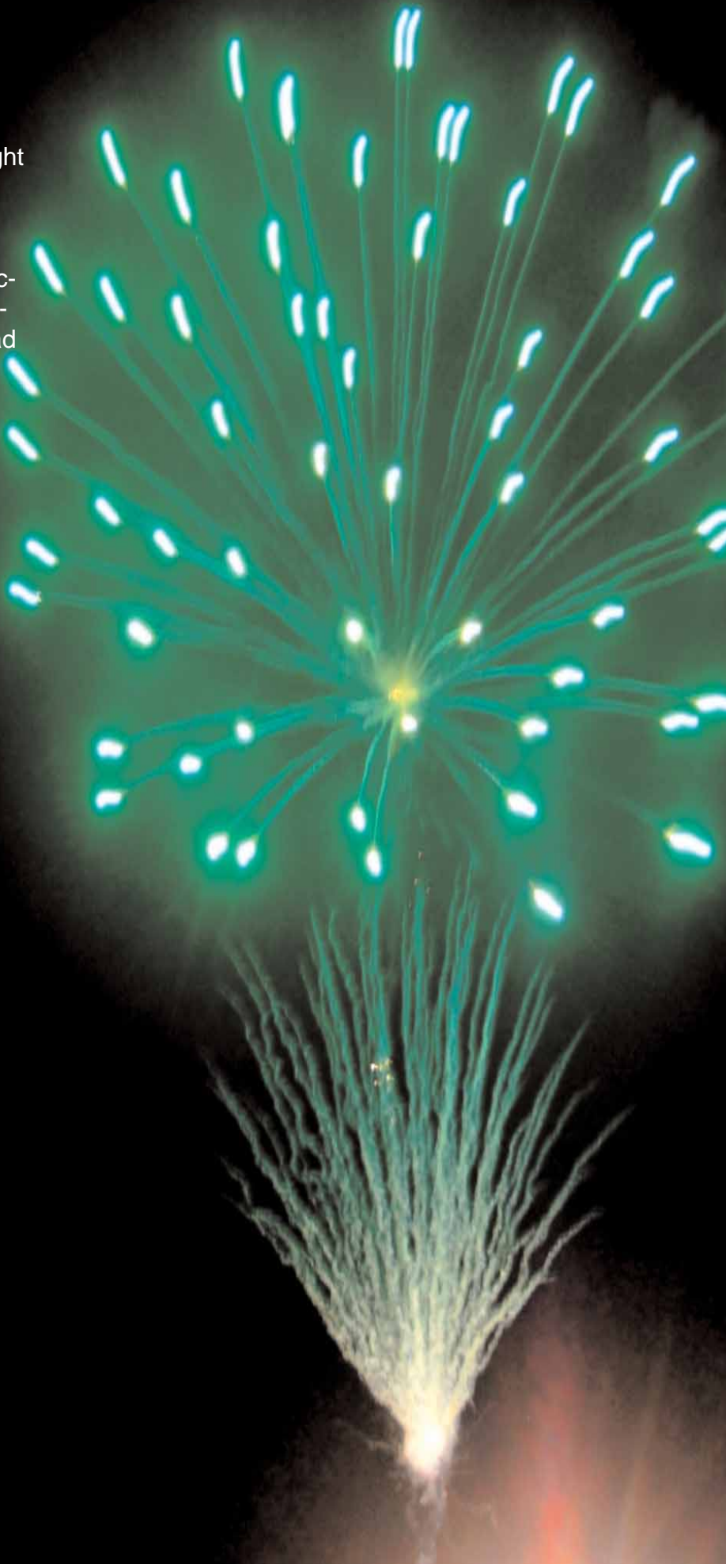


The big green bang

There is no question that the big green bang has got businesses moving in the right direction. There's still work to be done and government can do better to move things along, naturally. But for all that, the fundamentals are all there for the clean tech sector to not only survive but thrive. The question is, how much does the UK want to lead in this?

Here are the companies leading the way...

- AMEE UK Limited
- Aquamarine Power Limited
- Aquascientific Ltd
- Camfridge Ltd.
- Credit360 Ltd
- DeepStream Technologies
- E-Stack Ltd
- EVO Electric Ltd.
- Flybrid Systems LLP
- G24 Innovations Ltd
- GoLow Ltd
- IWMS Limited
- ONZO
- Orecon Ltd
- Origo Industries
- PowerOasis
- Proper Oils
- QuantaSol Ltd
- quietrevolution
- Regenatec
- Thermofluidics
- ViaPost Ltd
- Viridis Technology



AMEE UK Limited

Founder/CEO: Gavin Starks

Founding date: July 2005

Number of employees: 4

Turnover: Confidential

Website: www.amee.cc

This IT services company describes itself as “the world’s energy meter”. AMEE gathers energy consumption and emissions data then provides a technology platform for others to use that data. Its platform is open to developers who want to build applications on top of it, enterprises that want to track their own performance, or academics who want to distribute research findings.



AMEE
The world's energy meter



the greenbang barometer

AMEE is a seriously interesting proposition. DEFRA (the UK’s Department for Environment, Food and Rural Affairs) is already supplying data and the government’s own “Act on CO2” calculator runs on the AMEE platform. The company has done its research – 150 countries are represented – so it’s a comprehensive offering.

Greenbang also gives AMEE the thumbs-up for its open source stance – its code is open for others to use, and it encourages customers to release their data under Creative Commons so it can be shared – and the company makes its service free to certain non-commercial projects.

AMEE already has the likes of Google among its users – what more do you need to know?

the greenbang barometer

Like most companies in this renewable area, technology implementation is still at the prototype stage, with further development required before it becomes commercially viable. A key challenge is convincing investors that the science is sound, but here the company can flaunt its use of tried and tested elements and through simplification of design.

Aquamarine is believed to be one of the only companies in the world developing wave and tidal devices simultaneously. Scottish & Southern Energy has now climbed aboard with an initial investment of over £6m so it could be plain sailing from here on in.

"Our environmental responsibility underpins everything we do. It is the reason the company exists. It drives our code of ethics and we are very serious in policing implementation of our policies and procedures which are designed to protect the environment."
Aquamarine Power

Aquamarine Power

Chief Executive Officer: Martin McAdam

Founding date: 2007

Number of employees: 15

Turnover: n/a

Website: www.aquamarinepower.com

Aquamarine Power is one of a number of companies making waves in the world of renewable energy. Marine power is more predictable and constant than wind. Research by Southampton University's Sustainable Energy Research group reveals that marine energy could supply 10 percent of the UK's current electricity needs, while others say it could be as much as 20 percent.



Aquamarine is currently gearing up to test its first full-scale wave energy device called Oyster. It's an oscillating wave surge converter - think of it as a water pump powered by waves passing over it. The water is pumped to a hydroelectric plant onshore, which is designed to generate 300 to 600kw of power from each unit installed in shallower shoreline waters, to be fed back into the grid. As the system pumps water to shore, it can also be used to directly produce fresh water by reverse osmosis.

Aquamarine is also developing a tidal device, Neptune, which sources energy from tidal flow. Using technology inspired by wind turbines, the system can generate 2.4 MW of energy, the company claims, and is designed to be competitive with other forms of electricity generation on the UK market.

Aquascientific

Founder, CEO: Dr Adrian Janssen,
Prof. Michael Belmont

Founding date: June 2006

Number of employees: 4

Turnover: Still in R&D

Website: www.aquascientific.com

Investment: Technology Strategy Board
- £250,000; Royal Society £75,000

Aquascientific is tapping the power of the ocean but the emphasis here is on tidal technology, said to be more reliable than wave power.

The MRev (momentum reversal) is the company's tidal turbine, a model much smaller than other propeller and hydrofoil designs that provides the same amount of power. The size of this makes it cheaper to manufacture and its carbon footprint is smaller than other turbines because it uses less steel and concrete.

Three prototypes have already been built and provisional permission has been granted to test the turbine in the River Exe later this year. Unlike propeller-based systems, Aquascientific's turbine is low speed, high torque so more fish should escape alive... The company also claims little disturbance to the sea bed from the system.

Aquascientific™

the greenbang barometer

Clever tech is all very well, but as the VCs might say, it all comes down to 'show me the money.' Aquascientific can do that too – it has done a lot of work on making the time to return on investment shorter than traditional turbine systems. Its work on making the turbine as undisruptive as possible to its environment is also a plus in Greenbang's eyes.

The big selling point in the design is that the turbine can be made to fit the site. Unlike propellers and hydrofoils, it can be tall and thin, short and fat or square to ensure that you are collecting energy in the strongest flow. So the device is not only suited to the deep sea but it is also suitable for shallow waters and estuaries. Not stopping at ocean energy, the company is also incorporating this design in a wind propeller for the domestic market. It is looking for a £3 million investment. Any takers?

the greenbang barometer

The company looks like a mix of science and business know-how. As well as the physicists and academics on board to crack the technical side of things, Camfridge also has a CEO with a history at the helm of a couple of start-ups, which will doubtless be a boon to the business.

Unlike most fridge and cooling applications, the Camfridge technology uses little carbon and no polluting gas. It's also got some solid support from the Carbon Trust and after hitting a performance milestone recently, it looks like the company can soon start delivering commercial applications to its required specification and cost. Looks like things might be warming up.

"Establishing a business is the easy part, moving it forward at the very beginning is hard." - *Camfridge*

Camfridge Ltd.

Founder/ MD: Neil Wilson

Founding date: January 2005

Number of employees: 6

Turnover: Income from Partnerships

Website: www.camfridge.com

Camfridge is developing a new cooling and air-conditioning technology that promises to be 50 percent more efficient than current air conditioning applications. Given the cooling and air conditioning sector is not exactly environmentally friendly (it uses some 16 percent of the UK's total generated energy, rising to 50 percent in places like Japan and California) this is a step in the right direction.

Customers will be large manufacturers of air conditioning and cooling appliances. The company says its technology can be deployed in any household.

Camfridge uses a solid refrigerant to eliminate gas leakage into the environment. This helps to cut maintenance costs, especially for commercial applications, and makes the product easier to recycle at the end of its life.

Camfridge

Credit360 Ltd

Founder/ CEO: Mark Shields

Founding date: 2002

Number of employees: 20

Turnover: £1 million

Website: www.credit360.com

Credit360 makes software to analyse sustainability data to staff and customers. The credit360 software gives businesses a way to manage all their CSR data and helps them put in place auditable processes to gather that data in areas where it might previously have been a struggle. Project management, as well as corporate communications help, is also on offer.

the greenbang barometer

Given that we're all a bit eco-sceptical these days, Credit360 scores for giving companies a way to track how well or otherwise they're doing on the sustainability. After all, there's no better way to find funding for a green project than with proof you're doing the job properly.

Credit360 also gets the thumbs-up for offering an entry-level product. Smaller businesses can then afford to tackle the environmental issues that have largely been the preserve of large corporations. Credit360 is wholly owned by staff and has been profitable from day one – not an easy thing to manage.

the greenbang barometer

Energy efficiency is one of the easier sells in clean tech and smart networking is making massive inroads in some regions, not least the US. DeepStream's charm is that not only has it thought about the clever insides of the system, it's also worked on the outsides – the housing – to make it easier for companies to fit the system themselves.

DeepStream has made the transition from start-up to substance. A recent agreement worth \$16 million with Moeller, a supplier of industrial automation and distribution components, means that commercial application is not far off.

DeepStream Technologies

Founder/ MD: Mark Crosier

Founding date: 2003

Number of employees: 80

Turnover: £1 million

Website: www.deepstream.com

DeepStream Technologies' product gives you data of where, how and what energy is been wasted - and all this can be done remotely. This is done with digital sensors that can be embedded in a wide range of devices in the home, office or in industrial equipment. Essentially, the technology uses energy analysis in electrical circuits and products to create a smart energy network.

The result is that there's potential for reducing energy consumption by as much as 20 percent, the company says. The proprietary system's automated processes allow for the manufacture of three-dimensional electronic modules, a step up from two-dimensional printed circuit boards. The company has also set out to tackle the issues around the physical nuts and bolts of these modules, making them easier to fit into awkward spaces. The housing is hardy too – able to cope with hostile environments such as electrical arcing and high temperatures.

e-stack Ltd

Founder/ CEO: Shaun D Fitzgerald

Founding date: January 2008

Number of employees: 4

Turnover: Not given

Website: www.e-stack.co.uk

e-stack is a ventilation system that recycles heat generated in buildings to save energy by minimising fan power. The objective is to keep rooms comfortably heated yet regularly replenished with fresh air, keeping CO2 levels low. The company's system can be installed in any interior from schools to theatres, office buildings and houses.

The company reckons its system cuts in half the energy consumption of a building. It also eliminates cold draughts by mixing incoming cold air with existing hot air. e-stack also offers free cooling in summer by circulating the cool air that comes in at night. The technology is cheaper than alternative mechanical ventilation schemes, the company tells us.

the greenbang barometer

It's worth noting that the company was spun-off from the University of Cambridge and has got exclusive rights to use the ventilation technology. Not only has it got a bunch of very clever people behind it, it's able to use the fruits of its work without being jumped on by the competition. Clever strategy.

Unsurprisingly the system is proving popular. Sales have already been made and there are further orders in the pipeline. This is one start-up that doesn't look like it's going to have any struggles to reach substance. It's also got R&D work going on to improve the systems and there are prototypes already being trialled.

Greenbang is impressed and reckons there will be more tasty tech coming out of this company in the future. Clearly cutting capital costs for customers while also saving on the energy bills is the way to go. All in all, a viable strategy with cool results. Get it?

the greenbang barometer

Demand for electric and hybrid-electric vehicles is growing, there's obviously no doubt about that. And equally there's a growing demand for electric machines required to power these vehicles - Evo-Electric is already on the case. As well as keeping an eye on the upcoming hybrid market and aiming to work with vehicle makers, Evo-Electric can also do retrofit work with existing vehicles, giving it an even larger market to tackle.



EVO Electric Ltd.

Founders: Dr Michael Lampérth, CTO;
Peter Beynon, CEO

Founding date: November 2006

Number of employees: 13

Turnover: First sales envisaged for late 2008

Website: www.evo-electric.com

Investment: £1.5 million

Evo Electric has developed a motor that is lighter than other designs on the market, the company says, yet still produces more power.

The company is working on versions for trolley buses, delivery vans and London cabs. The technology could be used in other applications, such as windmills and mobile power generators.

The products are based on proprietary "axial flux motor and generator technology", which could help hybrid and hybrid-electric cars become lighter, more powerful and energy efficient.

A new type of hybrid propulsion system, the Duo-Drive, is also on the cards. The company claims its products are cheaper than the alternatives, down to the choice of materials and manufacturing technique.

The company tells us: "We are currently seeking to raise a further £6m. We also received IP rights to electric motor technology developed by our CTO at Imperial College. This is a very significant non-monetary contribution by Imperial College, which owns any IP developed by professors."

Flybrid Systems LLP

Founders Jon Hilton, managing partner;
Doug Cross, Technical Director

Founding date: January 2007

Number of employees: 6 with two hires planned

Turnover: £897,000 in year one

Website: www.flybridsystems.com

Another solution for hybrid vehicles comes in the form of Flybrid Systems. This start-up has designed and developed a high-speed flywheel-based hybrid system that recovers and stores lost energy from cars. The Flybrid System claims to be roughly twice as efficient as current electric hybrid systems as well as smaller, lighter and lower cost. And when the product comes to the end of its life, it's easy to recycle, the company says.



Flywheel hybrids are not new. What is new is that Flybrid has managed to make the rotation speed of the flywheel in vehicles faster by as much as three times than was previously possible. That means Flybrid can cut down the size and weight of the device. Vehicles featuring the technology could be on sale by 2013.

the greenbang barometer

Here we see two founders who were willing to throw their own capital behind the project and with good reason - in the long-term, kinetic energy recovery is likely to be mandatory on every vehicle from cars to buses and trains. From a cost point of view, a car fitted with a Flybrid system is expected to save as much as 30 to 35 percent in fuel costs.

For high-mileage or high-fuel consumption vehicles, the savings are potentially significant and finding early favour with truck and bus fleets will be the cherry on the cake.



the greenbang barometer

We've heard a lot from G24i this year. The company is preparing a range of solar cell products for the market, from mobile phone chargers capable of generating 20 minutes of charge for every hour of sun - handy for countries where a lot of users are off the grid but not short on sunlight - to business-grade pay-as-you-charge kiosks.

Renewable energy is already proving popular with telecoms companies (for their carrier equipment) and a lot of work is going into renewable energy for the devices themselves - G24i has rather cleverly gone after both ends of the market.

The founders have risked \$60 million of their own capital to back the project - always a good sign, and they're also of the view that subsidized businesses are not sustainable. G24i's key objective is to produce low cost, easy to use products that compete with pricey battery power rather than the electrical grid. Developing countries, where electricity may not be guaranteed, is a clear market opportunity.

Focusing on the business fundamentals doesn't mean they have forgotten their values. G24i is committed to being a truly green company - earlier this year they were granted planning permission for a 2.5MW wind turbine, which will be installed in their car park. Combined with their onsite vegetable garden which supplies food to their free canteen for employees - they really are committed to "doing well by doing good."

G24 Innovations Ltd

Founder/Chief Executive: Robert M. Hertzberg, Co-founder and Chairman; Edward J. Stevenson, Co-founder and CEO

Founding date: September 2006

Number of employees: 60

Turnover: pre-revenue

Website: www.g24i.com (see also www.renewablecapital.com)

Investment: \$20m Morgan Stanley; \$30m from the 4RAE fund; \$60m from Founders

G24 Innovations (G24i) makes next-generation dye-sensitized thin-film solar cells as an alternative to traditional, and costly, silicon solar cells. G24i's solar cells try to mimic the process of photosynthesis. The cells are lightweight, durable and able to convert light into electricity even in dim indoor conditions, which makes them ideal for powering mobile electronic devices.



GoLow Ltd

Founder/Chief Executive: James Swanston, CEO; Chris Holt, Founder
Founding date: March 2008
Number of employees: 7 including part-time
Turnover: pre-revenue, pilots starting in Q3 2008
Website: www.golowtransport.com

'GoLow: don't go alone', pretty much sums up this business model. Essentially GoLow is a technology platform to make road transport more efficient. The initial focus is the taxi and private hire vehicle industry, which currently uses 750,000 tonnes of fossil fuels a year. These vehicles are empty of passengers about half of the time they're working, with airport journeys one of the biggest culprits.

GoLow systems will match customer demand with the best vehicle for the job, by identifying a vehicle as close to a pick-up point as possible. So instead of a taxi taking a passenger from the airport and returning home empty, the GoLow system will find a customer heading in the same direction as the taxi on its way back to base and match them up: no more empty taxi.

the greenbang barometer

It's still early days, but aside from reducing the dead mileage, GoLow hopes to get the best use out of vehicles on the road. Getting customers to share a journey (not always easy) or using a vehicle to deliver courier packages as well as passengers are two examples of how this might work. GoLow also encourages use of telematic devices to measure driving styles and help drivers to be more efficient.

The company impressed Greenbang not only through its smart use of technology, but for the sheer simplicity of its business model: find a car that needs a passenger, and a passenger that needs a car and bring the two together. So simple even your granny could understand it. GoLow also has the advantage of being an easy sell to both businesses and individual consumers too, by promising nice eco-credentials as well as money saving.

the greenbang barometer

Proof if proof were needed that some of the cleverest clean tech ideas don't necessarily have to depend on whizz-bang science: IWMS gets the nod for finding a green niche and exploiting it successfully.

The system is obviously working. In just two years the business has grown from a two-man band with just £10,000 in the bank to a 15 strong company with a turnover of £5 million. In the next six months that turnover is expected to double to £10 million. As we all know, turnover is for egos, but look at the clients: Caffe Nero, Waitrose, Allied Carpets, Goldsmiths, H & M, Paperchase, Lush and many more. It doesn't get much better than this.

IWMS Ltd

Founder/Chief Executive: Philip Mossop and Robert Twiselton

Founding date: May 2006

Number of employees: 15

Turnover: £5 million

Website: www.iwmsuk.com

Helping customers make money from waste reduction is IWMS's bread and butter. The company works with UK businesses to recycle more waste and send less to landfill. The system it developed generates revenue too. IWMS has invested heavily in technology for real-time monitoring and reporting of its clients' waste and recycling systems.

Customers can access information ranging from whether a waste collection has happened at one of their stores to just how much waste that store has produced over a 12 month period.

IWMSUK.com

Onzo

Founder/Chief Executive: Joel Hagan

Founding date: February 2007

Number of employees: 17

Turnover: £7 million+ contract with Scottish & Southern Energy

Website: www.onzo.co.uk

“Where smart consumer and smart grid meet.”

Onzo’s products help consumers to monitor their electricity usage, but it doesn’t stop there. As a consumer, you get a sleek display that gives real-time data on energy consumption. You can view the data on your PC, track energy use and download personalised tips.

The company also works with power suppliers, which distribute the product, giving them an opportunity to strengthen relations with customers.

the greenbang barometer

These smart meter makers are very smart indeed. As the company says on its website: “We can help to transform your business from solely supplying energy to the more sustainable business of providing tailor-made energy services.”

Scottish and Southern Energy is so impressed it has not only invested in the company but has secured exclusive rights to distribute Onzo’s products in the UK and Ireland.

The device can fit through a letterbox (no waiting at home for the delivery driver), can be recycled at the end of its life (green commitment all the way through) and has the sort of interface anyone could understand.

It’s not a big stretch to see why such a concept could prove popular. The company has done so well.

the greenbang barometer

The company's mooring system has been designed with an artificial reef, which is expected to boost the marine fish population. There are no chemicals or hydraulic oils and no emissions - good news for the ocean. The onsite maintenance approach reduces the need for heavy maintenance schedules and costly support vessels, so cuts downs on disturbance to the local environment as well as CO2 emissions.

Orecon's work also coincides with the government's decision to fund an energy-generating wave hub off the Cornwall coast in the next couple of years - if the company finds a place on the project, it'll be a major boost. Until recently, Orecon's founders were struggling through lack of investment. With venture capital now in place as well as funding from the Technology Strategy Board, it is moving ahead rapidly to the manufacture of the first 1.5MW unit next year.

Orecon Ltd

Founder/Chief Executive: David Crisp

Founding date: 2001

Number of employees: 10

Turnover: N/A

Website: www.orecon.com

Investment: VC funding: \$24 million in Feb 08

For the past six years Orecon has been developing the next generation offshore wave energy converter, known as Orecon MRC (multi-resonant chambers), to take advantage of all that lovely energy that the sea throws out every day.

According to the company, this next generation product is significantly more efficient and most importantly reliable than other options. The buoy has no moving parts underwater, it is designed to stay in place for 25 years, and could deliver 1.5MW generating capacity to onshore grids among other things.

Origo Industries

Founder/Chief Executive: Ian Houston

Founding date: September 2007

Number of employees: 8

Turnover: Estimated £2.4million in the first two years

Website: www.origo-industries.com

Origo Industries attempts to control, reduce and recycle CO₂. That's a big stretch. But in the short term the plan is to do this with cars and homes, and with the CO₂ produce biofuels and other revenue-generating materials, such as foodstuffs and building materials.

The key ingredient here is algae.

Two projects are currently underway. The first is the EcoBox, a recyclable product for the car industry which acts as a chemical sponge to absorb CO₂ from exhaust emissions. When full, the unit will be collected for commercial use. The other project is to capture and recycle of power generation CO₂, both in the home and for industrial use. This applies the same principles, though on a much larger scale.

the greenbang barometer

Commercial launch of the products is expected in 2009 so it is still early days, but Origo's premise is an interesting one - to allow individuals to use and potentially profit from their own personal emissions looks like being an compelling prospect for most consumers. Of course, as Origo's secret sauce is algae, it is attracting a lot of attention as this is an area that's exploding with ideas and expertise.

If successful, the company says the products could halve current CO₂ emissions from cars. EcoBox users, for example, could reduce CO₂ emissions to below 120g/km. Meanwhile users of the home unit can collect and recycle waste CO₂ into biofuel which could then be used to power their cars. When considering what it costs to fill up a tank today, that can only be a good thing.

Some early tests have been successful. Investors have injected money. We will wait and see with baited breath.

the greenbang barometer

PowerOasis is going after a \$10 billion market and a market that Greenbang would also like to mention is incredibly hungry for renewable energy options and the CSR (corporate social responsibility) kudos that goes with them. Unlike many of its competitors, PowerOasis has several renewable options on the table for base stations and sells the set-up know-how to go with it.

It also has patents on its all-important power controller, meaning its not only protected its clever ideas, but its also got some smart brains on board. The company covers the hardware, software, services and consultancy for off-grid, giving telcos a reason to not look anywhere else.

PowerOasis

Founder/Chief Executive: Nick Smailes

Founding date: December 2006

Number of employees: 9

Turnover: 2008 £250,000, projected 2010 £20 million

Website: www.power-oasis.com

PowerOasis specializes in powering mobile-phone base stations with renewable energy. Quite unique you might think, but for rural areas that are way of the electricity grid, very handy.

The telecommunications industry's next 1.6 billion customers are expected to hail from emerging markets. The telecoms industry is building a network infrastructure and base stations that need power. Grid-based electricity in emerging markets is patchy which means most operators must rely on fossil fuels. Generators need diesel and diesel is expensive.

Renewable energy may have a higher capital cost than diesel generators but is becoming a more viable economic solution, providing it is available.

Proper Oils

Founder/Chief Executive: Stephen Hurton

Founding date: February 2007

Number of employees: 4

Turnover: £120,000

Website: www.properoils.co.uk

Collecting used cooking oil from caterers and turning it into biodiesel may sound like a slippery business proposition, but it's working for Proper Oils. The company takes the used oil, refines it into biodiesel, then sells the fuel locally. Not only does this help to reduce congestion and pollution, it also cuts down on collection and distribution costs. The company is already collecting cooking oil from some 700 caterers.



the greenbang barometer

One problem is that this biodiesel may be more expensive than mineral diesel because there is a finite amount of local waste cooking oil. Still, caterers and customers are happy with the system because the CO₂ saving per caterer or customer can actually be calculated.

What's more, Proper Oils then helps its partners with marketing their own sustainability credentials. Also pretty unique, Greenbang thinks, is the fact that all the action takes place in a curtained articulated lorry trailer. So, no building costs, no expensive ventilation needed and it recycles an old lorry trailer.



the greenbang barometer

The price of solar energy is falling and may reach parity with fossil fuel before too long; at the same time, there's a clear potential for businesses to adopt solar power to cut their carbon footprint while increasing energy security and lowering operating costs.

Quantasol's solar cells could offer high-energy harvesting potential. They are easily installed at the point of demand, making them an appealing prospect for boosting clean power with zero emissions.

The company is talking a good game. Although Quantasol's cells use gallium arsenide and other materials that are a bit on the expensive side, the company is aiming to get more than 40 percent efficiency from them, compared to the under 20 percent that silicon and thin cells stump up.

The company is already recording efficiency greater than 27 percent and is confident of beating that number – if and when it does, the solar industry will be in for a shake-up.



Quantasol Ltd

Founder/Chief Executive: Kevin Arthur

Founding date: July 2006

Number of employees: 4

Turnover: pre-revenue

Website: www.quantasol.com

Investment: £1.35 million seed capital

Quantasol designs solar cells for use in concentrated photovoltaic (CPV) systems, which use lenses and mirrors to concentrate the sun's energy by 500 times or more onto very small pieces of semiconductor material. The cells can achieve much higher efficiencies than have previously been possible with traditional flat-plate or thin-film photovoltaic.

The company was incubated by Imperial Innovations to develop the solar cell technology (invented by Emeritus Professor Keith Barnham) and recently hit the necessary milestones with its latest cells to trigger the second part of its seed investment, netting the company £500,000.

“The leadership of the clean tech revolution will be in the hands of businesses, not governments who, with a few notable exceptions, seem incapable of moving quickly enough.”
Quantasol CEO Kevin Arthur

quietrevolution

Founders: Robert Webb (CEO) Richard Cochrane (CTO)

Founding date: 31 March 2005

Number of employees: 37

Turnover: 2008 - £3 million; 2009 - £10 million +

Website: www.quietrevolution.co.uk

Investment to date: £4 million so far. A further £6 million investment expected in August.

The UK is a windy place - in fact, windier than any other place in Europe. Predictions suggest by 2050, small-scale wind generation and other forms of energy micro-generation could provide 30 to 40 percent of the UK's energy needs. The problem is that wind can be unpredictable. In urban areas, particularly, some wind turbulence is inevitable.

Step in quietrevolution, which claims it can outperform conventional turbines because of its vertical axis and active control system. While a horizontal axis wind turbine has to physically rotate into the wind every time the direction changes, quietrevolution's vertical axis design means wind from a consistent direction to produce power isn't essential.

the greenbang barometer

From 2009, quietrevolution turbines will generate energy at lower cost than grid electricity in key markets. It's not a new claim for renewables companies, but it is one guaranteed to delight both consumers and investors alike.

Solar panels for the home have already proved that the average householder is keen to get involved with microgeneration, so it makes a lot of sense to turn to wind.

quietrevolution isn't the first to look at domestic turbines but it's certainly come up with an impressive design to please the harshest of NIMBY (Not In My Back Yard) critics – the turbine itself is a thing of beauty and quiet as a mouse. quietrevolution gets the thumbs-up for addressing the barriers to domestic wind adoption before they've really been raised.

the greenbang barometer

Biofuel has a bad name, but this is a far cry from biofuel processing in some countries, where raw plant fuel is imported, refined and exported with a green 'home grown' label on it. These guys are pretty open about what they do.

It should be said that the impact of alternative fuels on food production has been widely criticised.

However, Regeneratec is in the process of merging with early stage Indian start-up company CleanStar Energy, to form 'RegenaStar'. CleanStar has pioneered the cultivation of non-edible oil bearing trees on marginal land in central India, overseen by an NGO. If you're going to do biofuel, you could learn a lot from these guys.

It's worth noting that the Regeneratec's future biofuel will come from non-edible oils, such as jatropha and pongamia - the sort of plants that you would not want to eat, but could grow in areas where not much else would.



Regeneratec

Founder/Chief Executive: Mike Lawton

Founding date: May 2005

Number of employees: 8

Turnover: 06-07: £280,000, 07-08: £430,000

Website: www.regeneratec.com

Investment: £1.5-2 million in venture capital

Regeneratec owns patented technology that allows existing diesel engines to operate on pure plant oil (PPO), the raw material of biodiesel. Using the Regeneratec conversion technology and proprietary fuel additives, any diesel engine can operate on PPO. There's a cost saving for companies with big fleets that want to substantially reduce their carbon footprint whilst providing a cost-effective differentiation to competitors.

The company says it is seeing 'traction' in its target market of high-use, depot-based vehicles such as buses, trucks and refuse vehicles, where alternatives such as battery or hybrid cars are either technically unviable or way too expensive.

Regeneratec is currently developing a plant oil based lubricant with the German company Fuchs, designed to be fully compatible with biofuels, thus overcoming the incompatibility of biofuels with conventional lube oils. The lube oil is currently performing well in pre-release trials and Regeneratec will have an exclusive licence to exploit it in the territories where it operates.

Thermofluidics

Founders/CEO: Tom Smith/Christos Markides

Founding date: February 2006

Number of employees: 3

Turnover: Loss-making, expected to breakeven in 2011

Website: www.thermofluidics.com

Thermofluidics is a technical start-up that has patented a cheap and reliable pump that has no mechanical moving parts and uses heat as a power source.

Known as the “Non-Inertive Feedback Thermofluidic Engine” (NIFTE), the pump could have quite a few industrial, agricultural and domestic applications. For the moment, however, efforts are concentrated on applying the technology to water pumping using waste-heat and heat from the sun.

In the first instance the company’s focus is on hot water circulation pumps in both fossil fuel fired and solar-powered domestic hot water systems. Within five years of trading expected returns from these applications are expected to be \$160 million and \$130 million respectively.

the greenbang barometer

Because it is low cost to produce, the device opens up possibilities for pumping, heat pumping or compressing in applications where it's currently not an option.

The pump could be used anywhere from big power stations to micro-electronic components. There are very few companies working on waste heat recovery and low temperature solar thermal, because it's considered to be technically difficult and a bit 'blue sky'. However, the potential is huge.



thermofluidics ltd.

the greenbang barometer

When we looked at ViaPost, we pondered, why not just documents by email the whole way? Sure – in a perfect world, that would seem sensible. But some people still want to send paper, and the demand for that isn't going away soon.

If claims that Viapost delivery reduces the carbon footprint of each letter by 80 percent, this will certainly be a model for heavy users of the postal service.

International expansion is on the cards too, so Viapost has a path to growth as well as a further hook for customers on the way.

Viapost can also charm with cost cuts - the real cost of sending a letter falls from £1 to just 27p plus VAT, says the company. It's also worth noting that in the future, the company is looking to let customers use Viapost without any word processing software (the company is a partner of Microsoft) by creating the correspondence to be printed via their browser.

Cunning – nice to see a company with the next generation of product already in the pipeline.

ViaPost Ltd

Chief Executive: Simon Campbell

Founders: Ben Way, Charlie Lass

Founding date: January 2007

Number of employees: <10

Turnover: <£1m

Website: www.viapost.com

If you thought the internet had sounded the death knell for snail mail, think again. In 2007, the Royal Mail handled £22 billion items of post. (Remember what it felt like to receive a personal letter?) The bad news... post travelled thousands of miles and used a lot of fuel its way.

Enter Viapost, a company that has coined the concept of Post over Internet Protocol (PoIP) or put more simply, the last mile of post. Rather than printing invoices and such like in their office and sending them across the country, companies send electronic versions to Viapost, which prints them at the nearest regional centre and then delivers them.

Viapost has set up regional print centres around the UK and its secure software means people can now send physical post anywhere in the UK from their computer.

V I A P  S T

Viridis Technology

Founders/CEO: Raymond Stack

Founding date: Jan 2008

Number of employees: 6

Turnover: pre-revenue

Website: www.viridis-tech.com

Viridis Technology has developed a carbon-cutting product called Viridis CARE. (CARE part stands for carbon, asset, resource and energy.)

The technology provides data on energy, gas, water, pollution and wastages to help them achieve corporate social responsibility, efficiency and sustainability targets

It also has tools to help reduce energy waste and therefore their operational costs. Lights will intelligently switch off if a room has been empty for a certain length of time, for example. Or if resources like gas, water and electricity are being wasted, the CARE system can track it, let the company know where the problem is and so help them fix it. The system also updates when new environmental regulations are passed, with site managers notified immediately and the data can be accessed from mobile devices as well as PCs.

the greenbang barometer

It's still pre-revenue, but the benefits are obvious to the stingiest of companies: boost your green credentials, cut your costs and even make back the money you spent on the system with all the cash you saved. It's an appealing proposition for both enterprises and building managers alike.

Such company-monitoring tech isn't new, but Viridis looks like it's gone to great lengths to cover everything you might want to track and then some – from lighting to leaks. It's also got the built-in bonus that as well as registering the problems, and can even allow companies to solve them automatically... “Don't get the receptionist to turn off your lights at the end of the day, get your Viridis system to do it automatically when everyone's gone home”.