



Green Companies with Potential

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No matter if you're a technical trader, bear, bull or fundamentalist, we all dream of the multi bagger returns when we are on the lookout for the next sexy company, sector. Oil & Gas, Leisure and Gaming stocks and related companies have all played their part and produced multi bagger returns. At www.lemminginvestor.com our members have been blessed with many outstanding growth companies in little over three years and will be well aware of our move towards new innovative green energy companies featured last year, not because they offer instant returns for the impatient investor, but long term returns for the patient investor, where buy and hold actually works. We have identified several companies because we believe they offer high growth, management excellence, innovative solutions to today's energy demands, while offering protection we are all facing as our climate changes.

The investment environment is changing for companies in a diverse energy sector, some of which should yield high growth for years to come, in areas we believe are rapidly changing - New exciting areas like **Emissions Trading, BioFuels, Solar Power, Fuel Cell** and **Ethanol fuel**. This report will focus on both greener energy markets and companies within those markets which are already benefiting, and those we expect to do so in the not to distant future.....we hope.

Before I go any further, I should add there are many risks associated with new energy companies; not least little is known historically about these companies. Their technology maybe at an early stage of development, R&D spend may prove a strain on financial resources or political risks associated with the origin of the company. All new innovative companies come with high risks ahead of commercialisation and in some cases, no proven products and or no proven market for their products.

Greener Future a must

Energy, or the means by we generate it has always been a hot topic, never more so than right now and not just because of high oil prices and worries, political instability in the Middle East. New innovative companies with real commercially viable ideas across a wide range of energy fields that actually work make for real exciting times ahead - Pace is picking up and the sector hotting up. The aim of this report, is to identify potential high growth candidates for the patient investor – some you will note some have already sprung the starting blocks.

Energy sustainability and other issues of environmental importance are a national and international priority, with the potential global environmental problems facing mankind in the next 10-50 years. Concerns regarding environmental pollution and climatic change have raised the general public's concerns regarding the environment to an all-time high.

The issue of stopping the growth (and preferably lowering) of atmospheric CO2 levels and other

greenhouse gases, is one of great importance, and possibly the one key factor in reducing the ever increasing threat of global warming and its associated threats to the earth's weather systems, ecosystems, and the overall quality of life. Realistically emissions need to be reduced by about 60% to stop growth, however, that target at present appears to be unattainable. Thus, our aspirations need to be modified as to one of minimising the rate of change.

Reducing CO2 emissions is a priority globally, as well as here in the UK, where innovative companies are seizing opportunities within the UK industry to leverage its traditional strengths and take a worldwide lead in clean energy. There is co-ordinated and comprehensive support and funding – including the recent announcement of £40 million for carbon abatement technologies and £15 million for hydrogen and fuel cell demonstration projects. This enables expertise in the marine, oil and gas industries for example to be transferred across to develop renewable energies and 'greener' ways of burning fossil fuels.

Greener Methods

Ethanol

As previously mentioned in our ethanol boom [article](#), the U.S of all places, is waking up to the need to be greener, and now it looks as though the U.S has finally recognised that energy dependence is America's economic, environmental and security Achilles' heel, and is about to take a giant step to free itself.

Ethanol is an alcohol fuel made from distilling sugars in crops, primarily corn in the U.S. In some states, a gasoline blend with 10% ethanol - E10 or E85 - a blend that contains 15% gasoline and 85% ethanol; all of which widely used to reduce carbon monoxide emissions.

Five-million-plus ethanol-ready cars and trucks are already on the road at \$200 extra cost for each, without Detroit ever feeling the need to tell the public. Auto makers have quietly added the flex-fuel feature to get a break from fuel-economy standards.

An unlikely alliance of venture capitalists, Wall Street investors, auto makers, environmentalists, farmers and politicians are putting real money into bio-refineries, car engines that switch effortlessly between gasoline and biofuels, and R&D to churn out ethanol more cheaply.

About one out of every 40 cars and trucks in the United States can now run on a commercial mix of gasoline and ethanol, which is mostly made from corn.

Ethanol enthusiasts, such as corn growers and the politicians who represent them, would like that number to rise. The federal government is helping with subsidies for ethanol. We think the future for ethanol, or the greener method used to produce it, will be via high cellulose plants, not corn. Although cellulose ethanol is still an experimental process in which ethanol can be made from almost any type of plant, this still expands the source material for biofuels. And by using trees, grass or crop wastes, energy input into the process may be reduced.

Who can benefit from the expected ethanol boom?

Renova Energy, (RVA - 194p) is profitable ethanol production, distribution and marketing company based in Torrington, Wyoming, U.S, but listed in London where the company raised £7million, to help fund staged expansion of its plant state side, where it hope to double its production to 12 million gallons of ethanol within a year and up to 100 million gallons by 2010. Clearly a company with huge growth prospects.

Photovoltaics (PV) - or solar cells as they are often called, are semiconductor devices that convert sunlight into direct current (DC) electricity. Groups of PV cells are electrically configured

into modules and arrays, which can be used to charge batteries, operate motors, and to power any number of electrical loads. With the appropriate power conversion equipment, PV systems can produce alternating current (AC) compatible with any conventional appliances, and can operate in parallel with, and interconnected to, the utility grid.

Is geography ever a problem? You can't really expect solar to do well in Scotland

You do want sunshine, but there are some subtleties in the technology. For example, thin film can generate more power with less sunshine versus conventional technology. But in general, the more sunshine there is the more electricity you're going to be able to generate. You're always going to produce more in Australia, Southern Europe, for example, than say, Scotland.

Demand for renewable energy solutions, and solar power technologies, in particular, are growing at an unprecedented rate, helped considerably by Government subsidies worldwide to reduce reliance on fossil fuels and to combat the effects of climate change. In consequence a mesmerising first set of figures have appeared from AIM newcomer **ReneSola (SOLA - 424p)** which raised £26 million, is a major manufacturer in China, of solar wafers. In the solar market, two types of solar PV companies are successfully raising money; those producing thin-film or non-silicon PV cells, and those with access to the cheap labour and rapidly expanding silicon manufacturing capacity of Asia.

Another PV company worth a closer look, **Romag Holdings (ROM - 137.25p)** a rare breed among the renewable companies listed in London, in that it is a long established and profitable. AIM listed Romag has carved out a niche market the supplied specialist glass products, including blast and bullet-resistant glass, more recently, building integrated photovoltaic (BIPV) glass: solar cells contained within laminates that are produced for architectural use, where the company has witnessed excellent growth of 300%, which equates to almost one third of total sales.

New Report by Paul Maycock and Travis Bradford, Projects future for the Global PV Market Authors predict 50% drop in costs of manufacturing PV components by 2015. The report points to significant cost reductions primarily due to volume purchasing of raw materials and reduced silicon consumption owing to thinner slices and higher efficiency, have resulted in new plants with fully burdened module manufacturing costs at the \$2.40-2.75 per peak Watt (DC) level. (Note: these costs do include the recent rise in the cost of pure polysilicon from an average of \$20/kilogram in 2001 to over \$50/kilogram in 2006.) which bodes well for both ReneSola and Romag.

The science bit

There are many types of solar cells. **Polycrystalline** (more than one crystal), **monocrystalline** and thin film. Monocrystalline is presently the most efficient at converting light energy into electricity. Sometimes as high as 20% but more usually 15%. A monocrystalline cell is made from a thin slice cut from a single crystal of silicon. A grid of metal is then embedded over the wafer ending in the contacts and other layers added. Thin film cells are plated onto a plate of glass. They are much cheaper to produce, but only around 5% efficient and heavy.

A single cell is not of much practical use, producing less than a volt. Several cells have to be connected in a series of cells to produce a usable voltage. The voltage increases proportionally. 10 cells connected in series will produce about 7.5 volts. 20 cells 15 volts and so on. A number of cells (a battery) linked and mounted together is known as a solar panel.

Efficiency - The Sun's energy reaching the surface of our planet is roughly 1 kilowatt per square meter. Before entering our atmosphere it is about 20% more: 1.2 kilowatts. That's why astronauts always look so bright. At 15% efficiency 10 panels each measuring 1meter by 1 meter would power 1 1/2 bars on an electric heater. 20 panels would power an electric kettle. This of course

assumes that the sun is shining.

Fuel Cell Technology

A fuel cell is a device that produces electricity silently via an electrochemical reaction without combustion. Hydrogen ions from hydrogen-rich sources such as methanol, natural gas, or petroleum are combined with oxygen to generate power. A fuel cell is a cell producing an electrical current direct from a chemical, like in a battery, differing in that it is designed for continuous replenishment of the reactants consumed. It produces electricity from an external supply of fuel and oxygen as opposed to the limited internal energy storage capacity of a battery. Fuel cells have a very low voltage output, so usually several fuel cells are stacked together to increase the output. Because they operate at almost constant efficiency independent of size, small fuel cells can operate nearly as efficiently as large fuel cells. Applications of fuel cells can vary from small, battery-like portable applications to large-scale power generation to transportation. Because of their efficiency and reduced pollution, fuel cells offer a promising alternative to traditional power sources in transportation and other applications.

The cells retrieve about 50% of the energy in the fuel in the form of electricity - traditional gas-fired power stations manage only 30% - but that rises to about 85% when the captured heat from the catalytic process is included.

Currently, hydrogen is produced from fossil fuel sources such as natural gas, coal, gasoline, and methanol. For entirely clean and renewable hydrogen extraction, electricity (e.g. from wind turbines) or sunlight captured on solar panels is used to split water into hydrogen and oxygen. Until recently, this procedure was too expensive and the technology was not developed to a point where it can be done on a large scale. Fuel cells can also be equipped with a reformer which will extract hydrogen directly from the fossil fuel source. This process does produce some emissions, but it is still much cleaner and more efficient than the energy obtained from fossil fuel combustion.

Fuel cells are an old technology, problems have plagued their introduction. Present material science have made them a reality in specialized applications. The Solid Oxide Fuel Cell appears to be the most promising technology for small electric power plants over 1 kw. The Direct Alcohol Fuel Cell appears to be the most promising as a battery replacement for portable applications such as cellular phones and laptop computers. It is difficult to tell at this moment which fuel cell will be most practical for transportation applications such as motor vehicles. Fuel cells used a electric power plants may be successful before vehicular ones are.

The car market on which so many hopefuls have foundered in despair at the long-winded process of acceptance is seen as something to avoid for the moment, but there are also large potential opportunities in combined heat and power. **CMR Fuel Cells, (CMF - 165p)** technology is applicable to most other types of fuel cells including, in particular, solid oxide, proton exchange membrane (PEM) and alkali fuel cells.

CMR, a Cambridge based company which demonstrated the world's first 'compact mixed-reactant' DMFC stack with power density of 200W/l in May 2005. At the London Grove Fuel Cell Symposium, in October, the next stage of development was shown with higher volumetric power density. In the same month CMR commenced work on an evaluation mobile phone DMFC stack with a major consumer electronics OEM.

New investors may have to wait till mid 2007 before the mass industrial promise begins to look credible, but the company hopes to be displaying more advanced working devices and to be in mass production by end 2007. With traditional battery technology almost at a dead end, there is unsatisfied consumer and military demand for more mobile power. CMR aims to produce higher power from packs of reduced size, weight and cost, and thus to replace, lithium batteries to drive portable gear - chiefly lap tops, music players, portable games players, mobile phones, cameras, and power tools.

The volume/output ratio of CMR's fuel cells is already far superior to existing batteries. Prices need

to come down, but volume production is expected to reduce them to an attractive level. Already there is improved functionality over traditional batteries.

Another company to benefit from global phenomena, A 2003 winner of the prestigious Carbon Trust Innovation Award, and a winner of the industry's top accolade by winning the Institute of Materials, Minerals and Mining's Gold Medal for 2005; **Ceres Power (CWR - 219.5p)** has transformed from its research and development roots to a business focused on delivering finished products to market and has a strong balance sheet.

Ceres is recognised as a leader in pioneering low carbon technologies and has considerable commercial potential, including targeting a range of global market applications including on-site and back-up generators, residential combined heat and power, and auxiliary power units for transport. Ceres has successfully designed and tested a 1kW fuel cell stack that generates sufficient power for the average home.

August 2005, Ceres signed a commercial development deal with British Gas to provide 'green' domestic boilers that will be capable of providing household electricity as well as heat for hot water and central heating. With comparable cost to the conventional boiler, the new boilers, powered by its fuel cells, have the potential to dramatically reduce household energy bills and cut carbon dioxide emissions. With increasing energy prices, there is a clear market for the Ceres Fuel cell stack. Ceres says it has enough capacity to satisfy any early demand from British Gas customers. Assuming all goes well, I would expect BG to promote and market the Ceres products in much the same way Mobile Telecom Companies do with Mobile Phones on contracts.....Real potential waiting to be unlocked. Patience required.

Tanfield (TAN - 55.25p) Based in north-east England, Tanfield is already established as the WORLD LEADER in zero-emission electric road going delivery vehicles. It is organised into five operating divisions, Engineering, Hire, Service and Maintenance, Aerial Access, Electric Vehicles, IT Services and Training and Others. Engineering designs and manufactures aerial access equipment. Hire, Service and Maintenance is provided for industrial equipment. Aerial Access designs and manufactures aerial access equipment. Electric Vehicles designs and manufactures electric vehicles. Plus connections in China, USA and east Europe.

It has road going electric delivery vehicles on trial with TNT Express, and Sainsburys. Plus Government assisted funding for trials in several UK cities. Plus a UK & Ireland contract for the maintenance of several thousand vehicles in the Dairy Crest delivery fleet.

There is competition in this sector as you would expect, a number of companies are promoting electric vehicles and showing off prototypes. Tanfield has them in production and on the road - with many years experience in doing so. And also on-site at airports, factories and depots.

Its market capitalisation recently surpassed £100m, which brings it onto the radar of certain fund managers.

We *like* businesses that are legislation-driven. Tanfield is being helped by new laws that are penalising polluters and favouring low-emission vehicles. The 'Working At Height' regulations that came in last year are driving demand for access platforms.....less risky, as you would expect of a company with more than 80 year history. Pick of the bunch, real progress could be just around the corner.

Ceramic Fuel Cells(CFU - 47.5p) An Australian company, is commercially developing highly efficient solid-oxide fuel cells (also known as ceramic fuel cells). These cells, unlike their predecessors, have a solid electrolyte separating the two electrodes. What appears to set it aside from other innovations in this arena, is that it's combined with a small heat and power unit to generate low cost 1kW of electricity and heat for hot water, using natural gas as the fuel. The cells can be fuelled by a variety of gases, including hydrogen, natural gas or coal gas suitable for large

scale manufacturing to meet commercial targets for cost and performance. Shares in CFU moved northwards in December on the back of news the company had entered into an agreement with Gaz de France and De Dietrich Thermique to develop a micro combined heat and power (CHP) unit for the French residential market. It is anticipated demand for more efficient power and heating systems continues to grow within the French market. De Dietrich Thermique, provides gas heating systems in the French market, then integrate the fuel cell into its condensing boiler platforms, while Gaz de France will conduct tests on the prototype.

CFU has orders for ten plants to be delivered to Germany's EWE, and expects trial orders from other EU Electricity generators in 2007.

Oil Refining

HydroDec Group (HYR - 26.5p) is developing and commercialising a high margin, oil re-refining process, which regenerates oil and removes dangerous contaminants such as PCBs. It can also treat a number of chlorinated organic wastes, known as Persistent Organic Pollutants POPs. The process offers a commercially competitive option for tackling some of the big challenges faced by the power, mining and chemical industries in dealing with contamination.

HydroDec **seems to be without competition and of great significance for the future of the planet.**

Those

searching for a profitable stake in 'green' companies likely to succeed, will find this one contains critical USPs, and offers intriguing prospects two years out from now.

Developed over 12 years by the Commonwealth Scientific and Industrial Research Organisation of Australia, HydroDec has entered into an exclusive 15 year license for the global marketing and distribution of the CSIRO's patented technology.

HydroDec uses an advanced form of catalytic hydrogenation, based upon standard oil and petrochemical industry packed bed hydrogenation processes. Patented IP prevents deactivation of the catalyst by hydrogen chloride and similarly reactive by-products.

This means that toxic, chlorinated organic waste, such as Dioxins, Furans, DDT, DDD, DDE, PCB, Chlorobenzene, Chlorophenol and HCB/HCBD can be destroyed in an environmentally safe, zero-emission, closed-loop process that has no direct air emissions. The technology has also been used to treat a variety of these chlorinated organic wastes, commonly referred to as 'Persistent Organics Pollutant' (POP's).

Dioxins

Dioxins enter the environment mainly through incineration processes and thermal processes in metals extraction and processing, as well as through the production and use of organochlorinated compounds.

The Stockholm Convention on Persistent Organic Pollutants (POP's) is a global initiative to protect human health and the environment from 'POP's' - chemicals that are highly toxic, persistent, bioaccumulate and move long distances in the environment. The first Conference of the Parties to the Stockholm Convention on POP's was held in May 2005. Currently there are 100 countries committed as Parties to the Stockholm Convention and another 51 signatories.

The Convention seeks the elimination or restriction of production and use of all intentionally produced POP's (i.e. industrial chemicals and pesticides). The Stockholm Convention also seeks the continuing minimization and, where feasible, ultimate elimination of releases of unintentionally produced POP's such as dioxins and furans from processes such as incineration.

Greenhouse gases

Greenhouse gases (GHGs) are gaseous components of the atmosphere that contribute to the greenhouse effect. Some greenhouse gases occur naturally in the atmosphere, while others result from human and animal activities. Naturally occurring greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Certain human and animal activities, however, add to the levels of most of these naturally occurring gases.

There are some 38 companies within green arena which could benefit in a changing investment World, which, in all probability, will require 2nd report. For example, wind power generator **OPT** looks to be a worthwhile candidate for inclusion, as does, emissions play, **ALK**, previously covered, albeit to early and carbon credit companies like **ECO** already capped at £208m and rising continuously at 76%/pa. **GTL** looks like doing well in the shorter term than the others. Following our coverage of **SOLA**, **PFLM** is also interesting as it covers thin film technology which is accelerating at 117%/pa during the shortage of polysilicon. However, readers should note the shortage of polysilicon is expected to be addressed during 2007/08.

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