



COMINO FOUNDATION

Newsletter - Developments in Technology to address Environment Issues Issue 09/3 - July 2009

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The Comino Foundation is concerned to help address current issues regarding the environment. To address these issues the Foundation encourages people to modify their lifestyle but it is the Foundation's view that advances in technology will eventually provide the solutions. This newsletter seeks to highlight advances in environment technologies in the recent months that will have a part to play.

Developments in understanding and combating climate change

The scientific principles which underpin climate change are not understood to the levels that are necessary to predict the impact of high carbon dioxide levels on the future climate, temperature and topography of the world and the action being taken, globally to combat global warming is only just emerging. This section of the newsletter highlights current developments in scientific principles and international action to combat climate change.

The Climate Change sceptics seriously challenge IPCC forecasts

[\(http://scienceandpublicpolicy.org/\)](http://scienceandpublicpolicy.org/) [\(http://www.co2science.org/\)](http://www.co2science.org/)
[\(http://www.nipccreport.org/aboutReport.html\)](http://www.nipccreport.org/aboutReport.html)

Many consider the climate change sceptics to either only have a limited understanding of the scientific principles involved in understanding climate change issues or to be biased against reducing the use of fossil fuels or are against Governments seeking to raise revenue. They accept that the 'Armageddon' consensus view as promoted by the Intergovernmental Panel on Climate Change (IPCC) cannot be challenged.

Several organisations, however, have progressively developed their scientific knowledge against the principles that they are not aligned to any business or political organisation and are dedicated to the advancement of sensible policies for the climate change and the environment based on rational science and economics. Three of the most prominent such organisations are [The Science and Public Policy Institute](#), [The Centre for the Study of Carbon Dioxide and Climate Change](#) and [The Nongovernmental International Panel on Climate Change](#).

The Science and Public Policy Institute publishes a monthly CO₂ report which tracks world temperature, where the 7 year trend is in decline and the NIPCC has just published an 800 page report titled '[Climate Change Reconsidered](#)'. This report explores, and comments on, the science surrounding every aspect of climate change. The report is endorsed by 31,478 named US scientists, 9,038 of which hold PHD degrees. The main thrust of these sceptical organisations is to demonstrate that natural phenomena are impacting on climate change more than greenhouse gas emissions with projections for climate change being far less draconian than those put forward by the IPCC.

The impact of nitrous oxide on climate change may have been ignored

[\(http://www.economist.com/science/displaystory.cfm?story_id=13437705\)](http://www.economist.com/science/displaystory.cfm?story_id=13437705)
[\(http://www.bbc.co.uk/climate/evidence/nitrous_oxide.shtml\)](http://www.bbc.co.uk/climate/evidence/nitrous_oxide.shtml)

A team of scientists working on behalf of the International Council for Science (ICSU), a Paris-based federation of scientific associations from around the world, have produced a report which questions whether the impact of nitrous oxide N₂O has been largely ignored with the concentration being on CO₂ through the International Panel on Climate Change (IPCC).

The report concludes that studies to date of the impact of N₂O may have under-estimated its impact by 3 to 5 times. Although N₂O is not common in the Earth's atmosphere, it is a more potent greenhouse gas than CO₂ and remains longer in the atmosphere. Over the course of a century, its ability to warm the planet is almost 300 times that of an equivalent mass of CO₂. N₂O is made by bacteria that live in soil and water and mainly comes from the nitrogen-rich fertiliser that modern farming requires. Since the 1960s the amount of fertiliser used by farmers has increased sixfold and is accelerating due to the growing of crops for bio-fuels. The report questions whether the use of bio-fuels is actually adding to global warming rather than the reverse.

The ICSU report suggests N₂O emissions are probably more important than has been realised. Previous studies, including those by the IPCC may have miscalculated their significance with the global-warming potential of most of Britain's annual crops being dominated by N₂O emissions. The broader issue is the extent to which humanity has hijacked the "nitrogen cycle" with the nitrogen cycle is changing faster and more profoundly than the carbon cycle, which has attracted much more attention. A group of scientists is now involved in an International Nitrogen Initiative and are meeting in Paris to try to organise an international assessment of the impact of N₂O. This would do for nitrogen what the IPCC has done for carbon. The rush into biofuels shows that without proper consideration of all greenhouse gases, not just CO₂, it is too easy to adopt expensive methods of mitigation that actually make things worse.

[Moving towards central electricity generation with near zero green house gas emissions](#)

Worldwide electricity generation generates 40% of green house gas emissions with worldwide demand for electricity increasing at 3% per annum. The technology already exists to near eliminate these emissions by 2050 although it is likely that emissions from central electricity generation will increase before 2020 before progressively falling thereafter. This section of the newsletter highlights current developments in moving towards electricity generation with near zero green house gas emissions.

[Solar Power and the Sahara Desert](#)

http://www.economist.com/displaystory.cfm?story_id=13982870

Building solar power stations in the Sahara desert and transporting the power to Europe using high voltage direct current cables is not a new idea but it is very expensive. A top level meeting, however is being convened by Munich Re, the world's largest re-insurer, on July 13th 2009 with 20 large multinational companies, including Siemens, E.ON, RWE, Deutsche Bank to discuss the formation of a consortium called Desertec. The vision is to build a network of solar power stations in Africa and Arabia and connect them to Europe.

The proposed technology is to use low cost mirrors to focus sunlight either onto boilers that make steam to drive turbines, or onto containers of special low-melting-point salts that will store heat overnight, so that it is available to drive turbines during the hours of darkness.

[Solar-thermal power stations beginning to become a reality](#)

http://www.economist.com/science/tq/displaystory.cfm?story_id=13725855

In addition to photoelectric cells there is an alternative technology for converting solar power into electricity. Concentrated solar-thermal technology is where a large number of mirrors concentrate sunlight to produce heat. This heat is then used to create steam, which in turn drives a turbine to generate electricity. They work best in areas of high temperature with high demand with several versions of the technology being developed.

A Power-Tower is already producing electricity for the Spanish grid and several large scale projects are now planned in the southern states of the US.

A floating wind turbine far from the shore is installed

(http://www.economist.com/research/articlesBySubject/displaystory.cfm?subjectid=8780295&story_id=13981218)

The wind blows faster out to sea than it does near the coast and a turbine out at sea would generate more power than one inshore or onshore. Attempts to put turbines in such places have failed to date because the water is generally too deep to attach a traditional turbine's tower to the seabed. One possibility is to put the turbine on a floating platform which is tethered to the seabed with cables.

StatoilHydro, a Norwegian energy company, and Siemens, a German engineering firm, have installed the first of their floating offshore turbines with a connection to Norway's electricity grid. This turbine is starting a two-year test period generating about 1 megawatt of electricity.

This new turbine, called Hywind, is the first large turbine to be deployed in water more than 30 metres deep. The depth at prototype's location, which is 10 kilometres south west of Karmoy, is 220 metres. The turbine, however, is designed to operate in water up to 700 metres deep, meaning it could be put anywhere in the North Sea. Three steel cables attached to the seabed prevent it from floating away and the tower sits on a conical steel buoy that extends 100 metres below sea level. The buoy contains 300 tonnes of concrete ballast that stops the structure toppling over by placing its centre of gravity well below the water's surface.

If all works well, the potential is huge. Siemens's windpower business unit believes the whole of Europe could be powered using offshore wind, but that competition for space near the coast will make this difficult to achieve if only inshore sites are available.

New wave energy device moves to the next stage of development

(<http://news.bbc.co.uk/2/hi/science/nature/8034884.stm>)

A wave energy device known as "Anaconda" is the most recent idea to harness the power of the seas. Anaconda's design is simple - it is little more than a length of rubber tubing filled with water. Waves in the water create bulges along the tubing that travel along its length gathering energy. At the end of the tube, the surge of energy drives a turbine and generates electricity. The device is being developed by Checkmate Seaenergy Ltd, which has been testing a small-scale 8m-long prototype in a wave tank in Gosport, Hampshire. Scale-model testing has given good results, and investment is being sought to develop Anaconda and begin producing the first full-sized units for ocean testing within the next three years.

Biomass generation from wood waste expanding in the UK

(<http://www.telegraph.co.uk/sponsored/business/businesstruth/5238177/Energy-and-environment-focus-on-Biomass-Helios-Energy.html>)

Biomass energy, the generation of power from waste wood, has been given impetus over the past few years due to the need for mitigation strategies for climate change. In the UK 10 million tons of wood goes into landfill sites every year. Helios, based in Grimsby and London, was set up in 2007 with the objective of building, owning and operating biomass energy generating plants using proven technology.

Helios is developing a 65MW biomass generation plant in Stallingborough, near Grimsby, which it has pre-sold to German utility group RWE. In addition to Stallingborough, Helios, which floated on the Alternative Investment Market in 2007, is planning a 100MW biomass power plant at Avonmouth on the Bristol Channel. It also has smaller 5MW-8MW projects that are designed to be where sustainable and renewable feedstocks to burn in the plant are readily available from sites such as breweries and distilleries.

[Developing microgeneration at the local level](#)

There is 10,000 times more sunlight than we need to meet the world's energy requirements. The technology to collect and deploy solar energy it is about to advance exponentially in a similar way to the development of silicon chips for computers. It is possible that 50% of domestic and commercial buildings, worldwide, could be generating their own energy from solar panels by 2050.

This section of the newsletter highlights current technology developments in microgeneration and, in particular, solar panel manufacture and deployment which is an important aspect of moving towards electricity generation with zero green house gas emissions.

[New design of thin film solar cells promises efficiency and lower cost](#)

[\(http://www.technologyreview.com/energy/21755/\)](http://www.technologyreview.com/energy/21755/)

[\(http://www.technologyreview.com/business/22745/\)](http://www.technologyreview.com/business/22745/)

Researchers at MIT have introduced a new type of silicon solar cell that could be much more efficient and cost less than currently used solar cells. The design combines a highly effective reflector on the back of a solar cell with an antireflective coating on the front. This helps trap red and near-infrared light, which can be used to make electricity, in the silicon. The prototype cell demonstrates 15% more efficiency with the potential to increase efficiency further. Thin film solar cells are much cheaper than conventional cells because they use less material.

In addition, Xunlight, a new start-up in Toledo, Ohio, has developed a way to make large, flexible solar panels which consist of thin film, amorphous silicon solar cells which can easily be integrated into roofs, building facades or vehicles. To boost efficiency the cells use triple-junctions with three materials so that the energy is captured from three parts of the spectrum.

[More AC power from solar panels](#)

[\(http://www.technologyreview.com/energy/22661/\)](http://www.technologyreview.com/energy/22661/)

Solar panels create DC power and typically all panels on a rooftop are connected to one large inverter that converts to AC power either for immediate use or connection to the grid. Enphase Energy of Petaluma, CA, is now making the first micro-inverters. These smaller inverters can be bolted to the racking under each solar panel, to convert DC power into AC for each panel individually. The company claims that the devices will increase a PV system's efficiency by 5 to 25 percent and decrease the cost of solar power.

[Reducing green house gas emissions from transport](#)

25% of green house gas emissions come from transport and it is important that the internal combustion engine is replaced with a form of energy that is free of emissions. This section of the newsletter highlights current developments in moving towards transport that is powered with zero, or near zero, green house gas emissions.

[Open-design hydrogen car launched](#)

[\(http://www.guardian.co.uk/environment/2009/jun/16/hydrogen-car-open-source\)](http://www.guardian.co.uk/environment/2009/jun/16/hydrogen-car-open-source)

The Riverside urban car which is capable of 50 mph, a range of 240 miles and acceleration of 0-30 mph in 5.5 seconds has been unveiled in London. It is powered by a 6KW fuel cell using hydrogen as the power source. It aims to prove that hydrogen automobile technology is now available. The designs for this car will be freely available on the Internet with the intention of accelerating the development of this technology.

The car cost £500,000 to develop through a partnership of Oxford and Cranfield Universities with Stephen Piech providing financial backing. The production vehicle is expected to be leased at £200 per month.

The intention of this newsletter is to advance knowledge and understanding of some issues associated with climate change. Any views expressed are those of the author and do not, necessarily, represent the views of the Comino Foundation.

Toyota and Aston Martin partnership to market a new 'green' mini
(<http://www.dailymail.co.uk/motoring/article-1196480/Not-fast-Mr-Bond-Aston-Martin-build-eco-friendly-20-000-supermini.html>)

Aston Martin has announced that they are to market Cygnet, a small urban runabout for Aston Martin customers only. The car will be based on the Toyota iQ super mini but with an Aston Martin grill, badge and luxurious interior. However, unlike Aston Martin's usual power it will only achieve 60 mph after 14.7 seconds and have a top speed of 93 mph. It's fuel consumption, however, will be only 65.7 miles per gallon with emissions at only 99 CO₂ g/km, which puts it in the lowest tax band.

The price is likely to be around £20,000 with second hand values expected to hold firm or even exceed the retail price. It is rumoured that other luxury car manufacturers are considering launching similar super minis.

Many large UK companies are investing in zero emission commercial vehicles
(<http://www.modczev.com/customers.asp>)

Modc is the world's first manufacturer of purpose built zero emission vehicles for commercial purposes. This Coventry based manufacturer was founded in 2004 by a team of automotive engineering experts with its vehicles being launched to the transport industry in March 2007. It has adopted the very latest in battery technology and LEAN manufacturing techniques to produce a range of urban delivery vehicles. Customers include Tesco, FedEx, Network Rail, and John Menzies amongst many others. Overseas dealerships are being appointed.

Moving towards a more practical battery for road transport
(<http://www.technologyreview.com/energy/22689/page1/>)

Lithium-ion batteries which are being used, currently, to power emission free vehicles have a number of disadvantages, for example the limited range on a single charge. Advances in lithium-sulphur batteries, which may make batteries more practical are now being made by the large chemical company BASF of Ludwigshafen, Germany, who are working with Sion Power, a company in Tucson, Arizona.

Apart from overcoming previous problems with lithium-sulphur batteries this new battery technology will offer at least 300 miles on a single charge and a 300,000 mile battery life which equals the life of a vehicle. High cost however, which comes mainly from the cost of lithium, is still a problem. Electric vehicle manufacturers expect this technology to become commercially available within 4 years

Other issues in reducing green house gas emissions

In addition to reducing greenhouse gas emissions by switching to energy sources that have no emissions there are other sources of greenhouse gases that mankind needs to address. De-forestation, melting permafrost and emissions from agriculture and livestock being the main issues which are addressed in this section.

Global interest in 'green' cement

(<http://www.walesonline.co.uk/business-in-wales/business-news/2009/04/17/cenin-builds-on-global-interest-in-green-cement-91466-23403565/>)

Cement production is responsible for up to 5% of all carbon dioxide emissions worldwide and is greater than the entire aviation industry. On average 1,000kg of carbon dioxide is emitted with every tonne of cement produced. Cenin, a company set up two years ago has developed technology to produce ultra-low-carbon cement from industrial by-products. Having established a research and development centre on Stormy Down, near Bridgend, and opening a small production plant it is attracting interest from around the world.

The product has undergone extensive customer trials over the past three years and in many circumstances is deemed to add technical properties to that of traditional Portland cement. The technology has been presented at a number of international conferences and has created worldwide interest. It is believed that there is real potential for global growth as the construction industry is under increasing pressure to reduce its carbon footprint. The company is seeking to be an independent supplier in the UK and supply the technology worldwide under licence.

More efficient light bulbs

(<http://www.technologyreview.com/energy/22656/>)

In recent years, many countries have begun to switch to energy efficient light bulbs but with both fluorescent and LED lighting, the quality of white light produced is not as good as many consumers wish.

An organic light-emitting diode (OLED) has now been developed in Germany which has the potential to produce the same, or better, quality of white light as incandescent bulbs but with power efficiencies considerably better than even fluorescent lighting. This could lead to an ultra-efficient light source for displays and general lighting which also produces high quality of white light.

A major investment in biofuels from algae by Exxon Mobil

(http://www.economist.com/sciencetechnology/displayStory.cfm?story_id=14029874)

Craig Ventnor the former head of Celera Genomics, which ran the human genome project during the late 1990s, and before the leader of the team which produced the first genetic sequence of a living organism has formed a new firm - Synthetic Genomics in San Diego. This firm is developing the industrial-scale culturing (biomanufacturing, as he describes it, rather than farming) of single-celled algae that have been genetically engineered to turn out fuel-ready hydrocarbons.

Exxon Mobil have agreed to put \$300m into this project with a further \$300m to come if things go well. This major investment is seeking to create a new generation of biofuels.

Kinetic road plates are an expanding source of local electricity

(<http://www.dailymail.co.uk/news/article-1193070/Shoppers-cars-soon-able-power-supermarkets.html>)

The weight of vehicles driving over road plates is fast developing as a new source of local electricity. This source of power is already operational at a Sainsbury supermarket in Gloucester and is scheduled to spread to other stores. This source of electricity will power all the tills and some freezers. Other applications of the this technology under consideration are entry into theme parks to power rides or use on motorway slip roads to power road lighting. There is potential for other uses to emerge.

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