



# COMINO FOUNDATION

## Newsletter - Developments in technology to address environment issues Issue 09/1 - February 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 first carbon market is launched in the US**

[http://www.forumforthefuture.org/greenfutures/articles/states\\_launch\\_carbon\\_market](http://www.forumforthefuture.org/greenfutures/articles/states_launch_carbon_market)

The Regional Greenhouse Gas Initiative (RGGI) launched in the US in September has created a carbon market covering Maine, New Hampshire, Vermont, New York, Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware and Maryland. The initiative caps carbon dioxide emissions from power plants across the ten states at 171 million metric tons of CO<sub>2</sub>. Pollution permits allowed under the cap are being auctioned on a quarterly basis. The first auction, on September 25, saw all 12,565,387 allowances on offer sold at US\$3.07 each to 59 participants from the energy, financial and environmental sectors.

RGGI will soon be joined by two other regional mandatory GHG emissions markets – the Western Climate Initiative and the Midwestern Greenhouse Gas Reduction Accord. These will cover a total of nearly 20 more US states and several Canadian provinces. Environmental groups hope their example will form the basis of an emissions market involving the whole US at federal level under Barack Obama's incoming administration

### **Plans to engineer the climate may be less effective than hoped**

[http://www.economist.com/science/displaystory.cfm?story\\_id=13013035](http://www.economist.com/science/displaystory.cfm?story_id=13013035)

Geo-engineering is the study of planet-wide engineering projects to reduce global warming. Those involved in this science hold that besides cutting the rate at which greenhouse gases are produced, humanity should also consider planet-wide engineering projects intended to reduce the global warming impact of these emissions. All sorts of ideas have been proposed, from filling the stratosphere with reflective particles, to increasing carbon absorbing algae in the sea though releasing large amounts of iron, to giant space-borne parasols designed to shade the Earth from the sun. The idea of such last chance technology, even if the options sound implausible, is a secret comfort to many who are frustrated by the lack of progress around the world in cutting emissions of greenhouse gases. Several scientists, however, have studied the various options in greater depth and reached the conclusion that the potential for these options may be limited.

### **Human activity is causing significant damage to the oceans**

**([http://www.economist.com/opinion/displaystory.cfm?story\\_id=12853926](http://www.economist.com/opinion/displaystory.cfm?story_id=12853926))**

The atmosphere of today is laden with carbon dioxide caused by man-made greenhouse gases. In consequence the oceans of the world are becoming more acidic which is impacting on various forms of life in the seas. Long established ecosystems are being disturbed. Global warming is causing ice caps and glaciers to melt and sea levels are expected to rise eventually by about 7 meters, although this may only be about 80 centimetres in the current century. The Royal Society believes that it will take many thousands of years for the oceans to return to state that they were in before the industrial revolution some 200 years ago.

### **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.

### **Geothermal Power potential in Africa**

**([http://www.economist.com/world/mideast-africa/displayStory.cfm?story\\_id=12821590&source=hptextfeature](http://www.economist.com/world/mideast-africa/displayStory.cfm?story_id=12821590&source=hptextfeature))**

To power its tiny economy, Iceland has already made use of what scientists call volcanism. Fiery bits of the Philippines also run on geothermal power. Both parts of the world are where the earth's crust is thin, with high temperatures just below the surface. Cold water is pumped down a deep borehole and returns superheated to spin a turbine and produce electricity.

The Rift Valley in Africa has the same geophysical conditions with experts thinking that this area is ideal for electricity generation from the Red Sea right down to Mozambique. The experts estimate that the region could produce 14,000MW in this way by 2030 which would be up to 25% of the region's estimated needs.

### **The accelerating global impact of renewable energy from wind power**

**([http://www.economist.com/science/tq/displaystory.cfm?story\\_id=12673331](http://www.economist.com/science/tq/displaystory.cfm?story_id=12673331))**

Generating electricity from wind power has come of age with wind power installations, globally, being expected to triple in 5 years from 94GW at the end of 2007 to nearly 290GW in 2012, according to BTM Consult, a Danish market-research firm. They will then account for 2.7% of world electricity generation and by 2017 this form of generation could account for at least 6%.

In addition, the technology needed to tap into this source of energy is getting cheaper: the cost of generating electricity from wind power has fallen from as much as 30 cents per kilowatt hour in the early 1980s to around ten cents in 2007. Government incentives, in the form of tax credits and feed-in tariffs, mean that wind power is already cost-competitive with electricity derived from natural gas and even coal in many markets. Even without a price on carbon emissions, the high growth of wind power is likely to be maintained for several decades.

In one policy area, at least, there is good news for President Barack Obama: his pledge to find alternative energy sources to wean America off its dependence on foreign oil is already being put into action. Last year America ramped up wind-power capacity to 25 gigawatts (GW), overtaking the previous leader, Germany, according to new data from the Global Wind Energy Council. America added 8.4GW of installed power in 2008, more than any other country. China is also investing heavily in wind power, nearly doubling its capacity for the fourth year running. Global capacity grew by 29% last year, the highest annual increase for six years.

### **Generating electricity from barrages in the Severn Estuary**

**([http://www.economist.com/research/articlesBySubject/displaystory.cfm?subjectid=8780295&story\\_id=13032525](http://www.economist.com/research/articlesBySubject/displaystory.cfm?subjectid=8780295&story_id=13032525))**

The UK Government has published a short list of potential projects for the harnessing the 15 metre tidal range of the Severn Estuary, the second highest in the world. The options include 3 possible barrages (extensive dams) and 2 tidal lagoons (man made tanks that fill up and empty with the tide).

Tidal energy is the best-behaved of renewable sources. Unlike wind or wave power (or even hydroelectricity, which depends on the rain), tides are governed by the laws of celestial mechanics and are totally predictable. The size of some of the plans is impressive. When the tide is flowing fastest, the biggest option — a ten-mile, £22 billion barrage running from Weston-super-Mare to Cardiff - could generate 8.6 gigawatts, around a seventh of Britain's peak consumption and more than every other renewable-electricity source combined. Although its average output would be below its peak, it could still supply around 5% of Britain's electricity every year.

Whilst such a scheme would reduce British carbon emissions, significantly, it would be impossible without a degree of UK Government funding. In the current economic climate this might be attractive in that a large number of construction jobs would be created, but greens concerned about the local environment are unhappy. The Severn estuary is an important habitat for birds; large barrages would destroy or damage much of it, as well as interfere with fish stocks in the river. Friends of the Earth, an environmental lobby group, thinks offshore lagoons might be a useful compromise.

### **Nordic countries reverse their ban on nuclear power**

**([http://www.economist.com/research/articlesBySubject/displaystory.cfm?subjectid=821240&story\\_id=13110000](http://www.economist.com/research/articlesBySubject/displaystory.cfm?subjectid=821240&story_id=13110000))**

The majority of Sweden's political parties have banned building new nuclear power plants for 30 years. This is now being reversed with the building of new nuclear power plants being proposed in neighbouring countries. Finland is about to build the country's sixth nuclear plant with Poland proposing two new plants. The Poles are discussing a consortium with Lithuania, Latvia and Estonia. Only the Danes, and to a lesser extent the Germans, are still anti-nuclear.

### **A new reactor design could make nuclear power safer and cheaper**

**(<http://www.technologyreview.com/energy/22114/>)**

Scientists at Intellectual Ventures have come up with a preliminary design for a reactor that requires only a small amount of enriched fuel where atoms are easily split in a chain reaction. This reactor is called a travelling-wave reactor. The aim is to run a nuclear reactor on existing nuclear waste which will be cheap and will avoid the dangers of nuclear proliferation for weapons.

### **What are the possibilities of beaming energy to earth from satellites?**

**([http://www.economist.com/science/tq/displaystory.cfm?story\\_id=12673299](http://www.economist.com/science/tq/displaystory.cfm?story_id=12673299))**

Light from the sun is the most abundant and cleanest source of energy available in the solar system. Around the clock, 1.3 gigawatts of energy pour through every square kilometre of space around the earth.

One option is to capture this energy using a vast array of photovoltaic cells mounted on a satellite in orbit around the planet. These solar cells would be illuminated at all times of day, whatever the weather or the season. This would overcome one of the main drawbacks of solar power on the earth's surface and with no atmosphere in the way to absorb or scatter the incoming sunlight, solar panels in space could produce over five times as much energy as those on the ground.

A solar-power satellite would send the collected energy down to earth in the form of a microwave beam, which would be picked up on the ground by an array of antennae, spread over several square kilometres in open country. The power density of the beam at the receiver would be little greater than what leaks out from a domestic microwave oven, so there would be no danger of incinerating entire cities. Microwave communications links are already used in the telecoms industry without doing any harm to wildlife.

There are many potential barriers to overcome, particularly cost, and space solar power is an idea which is ahead of its time. The necessary technology, however, already exists and is gradually falling in cost. It will take entrepreneurs as well as engineers to make tapping the energy of the great fusion reactor in the sky a reality.

#### **Abu Dhabi's ambitious plans for a zero-emission eco-centre in the desert**

**([http://www.economist.com/science/tq/displaystory.cfm?story\\_id=12673433](http://www.economist.com/science/tq/displaystory.cfm?story_id=12673433))**

In 2006 Abu Dhabi's development agency unveiled the Masdar Initiative. The purpose of this ambitious initiative is to pursue solutions to some of mankind's most pressing issues, i.e. energy security, climate change and sustainable human development. The initiative plans a research institute to develop environmental technologies, an investment arm to commercialise and deploy them, and an eco-city to serve as a test-bed for ideas as they are developed. An objective is to turn Abu Dhabi into a Silicon Valley of clean technology, where green-minded academics, entrepreneurs and financiers can work together.

The Masdar Institute of Science and Technology will admit its first students in 2009 and the first phase of Masdar city is under construction. Masdar has built up a big portfolio of renewable-energy investments, including a stake in an offshore wind farm in Britain and three solar-thermal power plants in Spain. It has also placed an order for machinery for two solar-panel plants with one being under construction in Germany, and the other being planned for Abu Dhabi.

#### **UK supermarkets embrace anaerobic digestion**

**([http://www.forumforthefuture.org/greenfutures/articles/waste\\_to\\_power](http://www.forumforthefuture.org/greenfutures/articles/waste_to_power))**

To combat increasing land fill charges UK supermarkets are investing in anaerobic digestion plants to generate electricity from their food waste that normally goes to land fill. To date there are plants at 38 Sainsbury stores and 14 Waitrose with Waitrose planning to include a further 30 plants at its stores in Spring 2009. The roll out of this technology is limited by the availability of anaerobic digestion plants.

#### **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.

#### **Improving the efficiency of thin solar cells**

**([http://www.economist.com/science/displaystory.cfm?story\\_id=12887225](http://www.economist.com/science/displaystory.cfm?story_id=12887225))**

Purified silicon, the basic material of solar cells, is expensive with the result that manufacturers have developed a generation of cells whose silicon layers are only a micron or two deep, as opposed to the established thickness of 200-300 microns.

Thin cells, however, are less efficient and fail to capture light at the red end of the spectrum. This means they produce up to 20% less electricity than standard cells of equivalent area which negates some of the advantage of lower cost.

To remedy this problem scientists at the Australian National University in Canberra and on the Institute for Atomic and Molecular Physics in Amsterdam have been trying to redirect the light that falls onto the surface of a cell in such a way that all colours are efficiently absorbed. Their chosen tools for this task are tiny particles of silver. Silver is, however, expensive but so little is used that the new technique would add only a few cents to the price of a solar panel.

**[A new solar concentrator promises to reduce solar cost and improve efficiency](http://www.technologyreview.com/energy/22204/)**

Morgan Solar of Toronto have developed a new type of solar concentrator that could significantly lower the cost of generating electricity from the sun. Unlike existing designs, there's no need for mirrors, complex optics, or chemicals to trap and manipulate the light. Morgan Solar's high-precision concentrator is part acrylic and part glass and is moulded so that light is trapped and bounces toward its centre. A secondary glass optic concentrates the light and directs it to a tiny, high-efficiency solar cell. The low-profile design promises to reduce both the cost of manufacturing and transportation. A number of pilot projects are planned for 2009 to test the concentrator in the field with commercial production expected sometime in 2010.

**[The next generation of solar cells is now under development](http://www.sciencedaily.com/releases/2009/02/090225223324.htm)**  
**<http://www.news.com.au/heraldsun/story/0,21985,25105900-2862,00.html>**

Teams of researchers all over the world are working on the development of organic solar cells which have good prospects for the future because of the high cost and shortage of the ultra-high purity silicon and other materials normally required. Plastic solar cells are made up of layers of different materials, each with a specific function, making what is called a sandwich structure.

It is estimated that it will be five to seven years before plastic solar panels will be mass produced but when it happens solar energy will be available to everyone. Scientists believe that the next generation of solar technology belongs to plastic and that plastic solar cell material will be made cheaply and quickly in massive quantities by ink jet-like printers.

**[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.

**[Electric cars go centre stage at Geneva Motor Show](http://www.google.com/hostednews/ap/article/ALeqM5i2e14vK9eNw8BQ2DctNw_mHepKzwd96MPMRG3)**  
**<http://www.motoring.co.za/index.php?fArticleId=4867281&fSectionId=751&fSetId=381>**  
**<http://www.mailonsunday.co.uk/motoring/article-1158798/The-electric-Vauxhall-car-300-mile-range-save-Britains-motor-industry.html>**

The auto industry puts ecology and economy on display at the early March 2009 Geneva Motor Show in an attempt to reverse plunging sales, plant closures, lay-offs and threatened bankruptcies. About 120 new or modified models are due to be presented as manufacturers from around the world seek to attract reluctant buyers. Environmentally friendly cars have been a marginal, though growing, component of the motor shows in recent years cars but these are now taking centre stage.

### **Are hydrogen powered cars still a reality?**

**([http://www.economist.com/science/tq/displaystory.cfm?story\\_id=11999229](http://www.economist.com/science/tq/displaystory.cfm?story_id=11999229))**

The promise of hydrogen-powered personal transport appears to remain elusive with the non-emergence of hydrogen cars over the past decade being particularly notable although hydrogen power had been supported by governments worldwide through billions of dollars being spent in subsidies and incentives to make hydrogen cars a reality.

In 2008 GM and Honda are deployed a few hydrogen-powered cars, which were put into the hands of carefully selected drivers to drivers in California. But the main problem holding back hydrogen vehicles is that there are no hydrogen filling-stations to fill them up. Honda is addressing this issue by developing a Home Energy Station, which drivers of fuel-cell vehicles can use to make their own hydrogen at home, by tapping into the domestic natural-gas supply.

Hydrogen sceptics point out that there are large capital costs associated with the production, transportation and storage of hydrogen, and, currently, there are viable alternatives. Advocates for fuel cell cars still remain, however, but mass deployment may remain some years away.

### **Super plug-in hybrid cars promise significant CO<sub>2</sub> reduction**

**([http://www.technologyreview.com/read\\_article.aspx?ch=specialsections&c=transportation&id=17855](http://www.technologyreview.com/read_article.aspx?ch=specialsections&c=transportation&id=17855))**

**([http://www.technologyreview.com/read\\_article.aspx?ch=specialsections&c=transportation&id=19181](http://www.technologyreview.com/read_article.aspx?ch=specialsections&c=transportation&id=19181))**

GM, Toyota and others are close to launching super plug-in cars which have much larger battery packs than current hybrids and can be charged from the grid. These cars will be able to cover about 20 miles on electricity alone, making the daily commute to work emission free.

### **Biodiesel from coffee beans is a new possibility**

**([http://www.economist.com/research/articlesBySubject/displaystory.cfm?subjectid=8780295&story\\_id=13056077](http://www.economist.com/research/articlesBySubject/displaystory.cfm?subjectid=8780295&story_id=13056077))**

Researchers at the University of Nevada at Reno have found that coffee grounds can yield by weight 10-15% of biodiesel relatively easily. Moreover, when run in an engine the fuel does not have an offensive smell—just a whiff of coffee. After the diesel has been extracted, the coffee grounds can be used for compost. They found that coffee biodiesel is comparable to the best biodiesels on the market. But unlike soya and other plant-based biodiesels, it does not use up plants or land that might otherwise be planted with food crops.

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