



COMINO FOUNDATION

Newsletter - Developments in technology to address environment issues **Issue 08/1 - March 2008**

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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 recent advances in environment technologies that will have a part to play.

Moving towards central electricity generation with near zero green house gas emissions

Worldwide electricity generation generates 40% of green house gas emissions with worldwide electricity demand increasing at 3½% 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.

China's new energy policy addresses green house gas emissions

(<http://www.rsc.org/chemistryworld/News/2007/October/24100701.asp>)

China's National Development and Reform Commission's Middle and Long Term Development Plan for Nuclear Power will see generation from nuclear power increase from the current 4GW to over 100GW by 2020 or 10% of China's generating capacity. This could increase to 30% by 2050.

There are also plans to increase the proportion generated from hydropower and non-hydropower renewables, e.g. wind turbines. 20% of generating capacity is planned from this source by 2020.

China's GreenGen project, partnered with Peabody Energy, will bring one of the world's first carbon capture and storage electricity plants into production

(<http://www.greencarcongress.com/2007/12/peabody-energy.html>)

Peabody Energy has just become the only non-Chinese equity partner in "GreenGen", the first near-zero emissions coal-fuelled power plant with carbon capture and storage (CCS), which is now under development in China.

The GreenGen power plant will be, initially, a 250MW integrated gasification combined cycle (IGCC) plant. Project design is complete, the site is selected and the first phase of the plant is planned to be on line in 2009. There will be further multiple phases to add carbon capture and storage and increase capacity to 650MW by 2020. The plant will capture at over 80% of green house gases emitted and store the CO₂ in nearby depleted oil fields to secure enhanced oil recovery.

This partnership brings together Peabody, a US company, and China's Huaneng Group. Peabody fuels 10% of US electricity generation and is the world's largest private sector coal company. Huaneng Group, the majority partner in the project, is one of the top 10 power companies in the world and the largest power generator in China. This partnership should accelerate the development of CCS in both the US and China.

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.

The worldwide annual increase in Wind Farms is over 25%
(<http://www.wwindea.org/home/index.php>)

The World Wind Energy Association's recent annual report showed that the worldwide expansion of wind energy was 26.6% in 2007. This rate of increase is likely to be maintained for the next few years. The USA, Spain and China are, currently, the largest users.

86% increase, worldwide, proposed for nuclear power plants
(<http://www.world-nuclear.org/info/reactors.html>)

The World Nuclear Association indicates that there is a proposed worldwide expansion of nuclear power plants of 86%, approximately over the next 10 years. As of January 2008 there are 439 operating nuclear plants (approximately the same number as in 1988). 34 new plants are currently under construction, a further 93 plants are on order, or planned, with a further 222 plants proposed. Whilst some existing plants may be de-commissioned this planned expansion will increase, significantly, the proportion of electricity generated from nuclear power plants worldwide (currently 16%) and make a proportionate reduction in green house gas emissions.

It should be noted that China, which has only 11 current nuclear plants, is currently building 5 new plants, has a further 30 ordered or planned, and 86 proposed.

New UK technology could re-cycle nuclear waste as nuclear fuel
(<http://www.guardian.co.uk/science/2007/dec/23/scienceofclimatechange.climatechange>)

The UK's nuclear industry has put forward a plan to build a plant at Sellafield to re-process the UK's 60,000 tonnes of nuclear waste to create free nuclear fuel in the UK for 50 years. This will also save the increasingly scarce and progressively more expensive uranium from Australia and Canada. The technology would have export potential. It is a UK Government decision to move forward.

Greater access to geothermal energy
(http://www.economist.com/science/tq/displaystory.cfm?story_id=10789290)

Traditional access to geothermal energy is in countries near to volcanic action, e.g. Iceland and New Zealand. If you dig deep, however, geothermal energy is everywhere since the temperature increases by 25° to 30° for every kilometre you go down.

The National Research Centre for Geosciences at Potsdam has drilled 2 x 4.4km holes at 400 meters apart. In one hole cold water is introduced under high pressure to secure stream at ground level from the other hole to drive turbines to generate electricity. It is estimated that there would be enough energy from the 2 holes to power a generating plant for 30 years. Given that you can drill as many holes as you like, this source of potential power to generate electricity is virtually inexhaustible.

Developing solar power at the local level

There is 10,000 times more sunlight than we need to meet 100 percent of our energy needs. 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.

There is already an exponential progression in the use of solar energy. Installations are doubling every two years. This section of the newsletter highlights current developments in solar panel manufacture and deployment which is an important aspect of moving towards electricity generation with zero green house gas emissions.

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Bright future forecast for solar energy

(<http://www.foxnews.com/story/0,2933,334808,00.html?sPage=fnc/scitech/innovation>)

Futurist and inventor Ray Kurzweil is part of distinguished panel of engineers that says solar power could scale up to produce all worldwide energy in 20 years.

Kurzweil has worked on the solar energy solution with Google Co-Founder Larry Page as part of a panel of experts convened by the US National Association of Engineers to address the 14 "grand challenges of the 21st century," one of which is making solar energy more economical.

Solar and wind power currently supply only 1 percent of the world's energy needs but advances in technology are about to expand with the introduction of innovatively engineered materials for solar panels, which make them far more efficient, thin film, easier to install and cheap. Google has invested substantially in companies pioneering these approaches. Regardless of any one technology, members of this expert panel are confident that the tipping point where energy from solar will be economically competitive with power from the grid is not far away and this could happen within five years.

More efficient, much cheaper solar cells

(<http://technology.newscientist.com/article/mg16021551.600>)

Thanks to a technological breakthrough, Michael Grätzel and his colleagues at the Swiss Federal Institute of Technology in Lausanne have developed a solar cell based on titanium dioxide that converts light to electricity with an energy efficiency as high as 33 per cent—double that of currently available photovoltaic cells. This is just one of the many technical developments that are producing highly efficient solar cells that will go on sale at a fraction of the cost of today's devices,

At \$1 per Watt, third generation solar panels bring green power closer

(<http://www.guardian.co.uk/environment/2007/dec/29/solarpower.renewableenergy>)

A Silicon Valley start-up called Nanosolar shipped its first solar panels -- priced at \$1 a watt. That's the price at which solar energy gets cheaper than coal power from the grid. While other companies have been focusing their efforts on increasing the efficiency of solar panels, Nanosolar have taken a different approach by developing process technology that makes it possible to produce 100x thinner solar cells 100x faster. Essentially, they've figured out how to print solar cells on thin sheets of aluminum with a printing press.

With an order book that stretches well into 2009 Nanosolar, which is based in California and part funded by Google, is about to open a factory in Germany which has aggressively subsidized renewable energy

Reducing green house gas emissions from automobiles

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.

Automakers demonstrate the beginning of the end of the internal combustion engine at Geneva

(http://www.businessweek.com/globalbiz/content/mar2008/gb2008034_491245.htm?chan=globalbiz_europe+index+page_top+stories)

Green was easily the automakers' favorite color at the International Auto Salon in Geneva, from March 4th to 16th where numerous presentations demonstrated that the auto industry is at pains to show it's serious about finding alternatives to petroleum which is now imperative with oil prices at record highs and regulators demanding reductions in carbon dioxide emissions,

Although there's a heavy dose of PR in the green claims of carmakers, there seems to be a consensus that the end of the gasoline age is within view, and that the auto industry needs to respond more quickly. There is still no industry consensus, though, on what kind of technology will replace gasoline and manufacturers are currently developing a range of technologies – ethanol, biodiesel, hybrids, electric and hydrogen.

While exotic technologies get most of the attention, many manufacturers believe that the best way to save fuel and reduce emissions in the short term is to make conventional cars lighter and more efficient.

Report advises that car emissions can be reduced dramatically

(http://business.timesonline.co.uk/tol/business/economics/pbr_2007/article2625602.ece)

Carbon dioxide emissions from cars could be slashed by almost a third within a decade, according to a review commissioned by the Government. The study, led by Professor Julia King, showed that it should be possible to cut emissions from cars by 30 per cent in the next decade and by up to 80 per cent by 2050.

Biofuels should play a role, but the report cautioned against relying too heavily on them. Electric vehicles powered from green sources were seen as the most likely clean cars of the fuel. Bringing in more efficient cars was seen as likely to increase the cost of new cars by £1,000-£1,500 but could be standard in five to ten years.

Tata in partnership to manufacture an ultra-green 'air car'

(http://business.timesonline.co.uk/tol/business/industry_sectors/engineering/article3396435.ece)

A car that runs on air and releases no pollutants into the atmosphere at low speeds could be offered for sale in India as soon as this year.

The three-seater fiberglass OneCAT weighs just 350kg and is expected to be priced at about £2,500. The technology under its bonnet is backed by Tata, the Indian conglomerate company. Refueling involves topping-up on compressed air, which is used to power the OneCAT's piston engine. In a couple of minutes - and at a cost of as little as £1 - the vehicle is ready to travel another 200 to 300 kilometers.

The vehicle, which burns small amounts of conventional fuels at higher speeds, has been developed by Moteur Development International (MDI), a French-based, family-owned group that has been working on a roadworthy "air car" for the past decade. Mass production moved a step closer last year when MDI agreed a partnership with Tata, under which the companies pledged to refine the technology. MDI, which is pitching its engine against rival green technologies such as electric vehicles, bio-fuels and hybrid cars, has separately said that it could launch its first mass-market model this year.

Honda's home energy station continues to develop

(<http://www.carbonfree.co.uk/cf/news/wk46-07-0001.htm>)

Plug Power announced the operation of its Home Energy Station IV (HES IV) at Honda's Torrance, CA facilities. HES IV is a continuation of ongoing joint activity between Plug Power and Honda R&D Co., Ltd of Japan. The fourth generation Home Energy Station is a fuel cell system that converts natural gas into hydrogen that can be used to fuel a hydrogen-powered car, while providing heat and electricity for residential use.

The Home Energy Station IV represents the latest evolution of the technology with a 70 percent reduction in size compared to the first unit, making it even more suitable for household installation. Simultaneously, efficiency has significantly increased.

The Home Energy Station provides the means for vehicle owners to produce onsite hydrogen, as well as heat and power, in an efficient and environmentally friendly way. It addresses the need for a reliable hydrogen infrastructure as automotive fuel cell technology continues to improve.

The quest for a practical car battery is accelerating

(http://www.economist.com/science/tq/displaystory.cfm?story_id=10789409)

Hybrid vehicles which are powered by a mix of petrol and electrical power from batteries are becoming well established with over 500,000 cars now on the road. The problem is that the batteries on current hybrids will only power a car, on their own for less than a mile.

Auto manufacturers have significantly increased their research and development in this field and the next generation of hybrid cars is about to emerge. Toyota and General Motors hope to be selling plus-in hybrid cars as soon as 2010. These cars are aiming to have an all-electric range of 40 miles with a small internal combustion engine to recharge the battery when necessary. Batteries will be kept 30% to 80% charged and will have a 10 year life span.

A variety of battery technologies are being pursued by auto manufacturers and it is not yet clear which technology will emerge as the most practical. It is clear, however, that the next generation of hybrid cars promises to have far lower green house gas emissions.

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