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March 2009: Highlights

R&D Topics

Commissioner warns against 'research protectionism'

Referring to the free movement of knowledge as the "fifth freedom" of the EU – in addition to goods, people, services and capital – the Commissioner for Science and Research, Janez Potočnik, has insisted that the development of the European Research Area (ERA) must be defended against nationalism if Europe is to have an efficient and cooperative research infrastructure. At a recent conference on research infrastructure he stressed that cooperation between member states on major projects is essential if the EU is to address the fragmentation and duplication of research, which has led to resources being wasted.

Potočnik acknowledged that research infrastructure is complex and expensive, saying it can be mutually beneficial for member states to invest jointly in major long-term projects as these are often simply beyond the reach of one region, one nation or even one continent. "The size of these projects, costing hundreds of millions of euro for construction and several tens of millions of euro every year for operation, means that we have to combine our efforts between member states and across Europe. This is even more critical in times of increasing pressure on national budgets" and he pledged to put in place a legal framework for research infrastructure which would allow faster construction and more efficient operation.

EU and Japan agree to work more closely together in energy research

The European Commission and Japan are going to deepen their collaboration in energy research. The prime areas for cooperation are photovoltaics, power storage and CCS. The result will be a new joint rolling-action plan including an enhanced exchange of information, scientists, managers and reviewers as well as more joint workshops on specific agreed sub-topics. Both sides also noted the potential of twinning of projects such as on power storage and CCS, and possible joint research projects for high-efficiency solar cells. Commission delegates expressed support for the greater participation of Japan in the EU Seventh Research Framework Programme (FP7). Both parties will also strengthen joint cooperation with other important emerging economies such as China or India.

Topics for cooperation are:

- Photovoltaics
 - concentration photovoltaics (CPV) and ultra-high-efficiency solar-cell modules;
 - intermediate band solar cell (IBSC) and quantum dot technology;
 - very efficient multi-junction thin film solar cells.
- Power Storage
 - testing and evaluation method for lifetime performance and safety (including standardisation);
 - pre-competitive next generation battery technology (including material research);

- integration of storage on the grid.
- CCS
 - safety of transport and storage of CO₂;
 - public perception;
 - standardisation and harmonisation.

For more, see: http://ec.europa.eu/dgs/research/index_en.html; <http://www.nedo.go.jp/english/>

CO₂ in natural gas fields dissolves in water, study shows

An international study has shown that in natural gas fields, which have stored carbon dioxide and other greenhouse gases over millennia, most of the CO₂ is stored by means of dissolving in water, rather than precipitating into minerals. Their findings, published in the journal *Nature*, have major implications for the study of the long-term effects of underground carbon storage. To date, engineering studies of CO₂ in geological storage have offered an idea of what might happen over the course of decades. Meanwhile, computer models designed to simulate what might happen to CO₂ injected underground have produced mixed results. In this latest research, the scientists used natural gas fields in China, Hungary and the US to study how CO₂ has been stored naturally underground over the course of millennia; this offers a natural analogue for future carbon storage projects.

The researchers found that the amount of CO₂ that precipitated into minerals was negligible compared to the 90% of the gas that was effectively removed by dissolving in water. Because of the danger for subsequent CO₂ loss from the resulting 'sparkling' water, the researchers stress the need for carbon-storage researchers to look closely at the potential mobility of CO₂ in water. The workers believe that although dissolution in groundwater implies the possibility of CO₂ transport and eventual leakage to the atmosphere, as is thought to occur in natural gas fields, this result does not mean that safe geological storage is impossible. But it highlights the need for a thorough assessment of the hydrogeological setting of prospective storage sites.

The new methods offered by the researchers also provide a powerful tool for future research into the behaviour of geochemical trapping mechanisms. The findings represent a significant advance in understanding the long-term effects of capturing and storing greenhouse gases in geological repositories.

For more information, see:

<http://www.nature.com/nature>;

<http://www.manchester.ac.uk>;

<http://www.nerc.ac.uk>

EU project to develop nanomaterials for more efficient solar cells

A new EU-funded project is turning to nanotechnology in a bid to dramatically ramp up the efficiency of solar cells. Called ROD-SOL ('All-inorganic nano-rod based thin-film solar cells on glass'), the three-year project has a budget of EUR 4 million, EUR 2.9 million of which will come from FP7's (NMP) programme.

The aim of the project is to develop new, more cost-effective nanomaterials for solar cells; solar cells currently in use have an efficiency of around 18%. However, producing these cells requires a lot of raw materials and is an extremely energy-intensive process. In the future, thin film solar cells are expected to dominate the market, as their production costs are much lower. But the efficiency of these new cells, at around 10%, is rather low. The ROD-SOL project aims to increase the efficiency of these thin film solar cells by developing and optimising the synthesis of silicon nanorods on cheaper substrates such as glass

or metal foils. The silicon nanorods are effectively tiny silicon columns whose diameter is measured in nanometres.

According to the project partners, these minute structures are ideal for trapping light energy so that it can be transformed into electricity. A major challenge for the researchers will be determining the optimal diameter of these nanorods, as the diameter influences the efficiency of the structures. The novel materials and processes developed in the project will be tested and implemented by the companies involved in ROD-SOL.

For more, see: <http://www.ipht-jena.de>; <http://www.picosun.com>

Energy Issues

Renewables could generate 40% of power by 2050

With higher oil prices burning bigger holes in our pockets and concerns about climate change gaining momentum, government officials and investors are increasingly supporting renewable energy technologies that could generate 40% of the world's electricity by 2050, according to research recently presented at the International Scientific Congress 'Climate Change: Global Risks, Challenges & Decisions' in Denmark.

According to the Advanced Energy Systems Dept. of the Helsinki University of Technology (TKK) in Finland, the findings show that with global political support and financial investment, previous notions that the potential for renewables was in some way limited to a negligible fraction of world demand were wrong. Recognising and prioritising the value of renewable energy technologies would effectively fuel their potential to provide the world with the energy it needs.

For example, the wind sector would be able to deliver its full potential if it concentrates on efficiently delivering, installing and connecting large amounts of wind power to the grid. In addition to reliability, availability and accessibility of the turbines, specific priority areas for the wind sector have been identified to effectively deliver the overall objective of cost reductions. Research areas including turbine technology, wind energy integration and offshore deployment will be crucial to maximising future growth.

In Europe, Britain's industry has called on the British government to find £625 million (EUR 675 million) for renewables support, and the latest data show that EU Member States France and Germany have committed large sums of green stimulus money, especially for renewables. More specifically, Germany has more than doubled its share of renewable energy since 2000. Data also indicate that more than 240,000 people are working in the country's renewable energy sector, particularly in SMEs. The German government has been very supportive in strengthening renewable energy by regulating the payment for the power fed into the grid through the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz, EEG), as well as other programmes.

The Czech Republic, meanwhile, is also a major supporter of renewable energy. Its latest move has been to adopt an action plan for biomass for the period from 2009 to 2011, targeting the greater use of biomass for power generation. This would help the Czech Republic fulfil its pledge to increase twofold its renewables-generated electricity (in gross domestic power consumption), which amounted to 4% in 2008. Czech utility, CEZ Group, increased biomass electricity production to 327 GWh last year, up 33%. It also used 347,000 tonnes of biomass in the same period, up 50% year-on-year, generating sufficient power to cover the needs of more than 93,000 households.

For more, see: <http://climatecongress.ku.dk/>; <http://www.tkk.fi/en/>

Europe building greener technology for cleaner cars

The EDISON project ('Electric vehicles in a distributed and integrated market using sustainable energy and open networks'), which began in late February, is targeting the development of a smart infrastructure that will alter the extensive adoption of electric vehicles powered by sustainable energy. Partners predict that EDISON will be instrumental in developing the infrastructure required for the large-scale roll-out of

electric cars in Denmark. A new and improved power infrastructure is needed because if everyone haphazardly plugs electric cars into the regional grid for recharging, major problems could erupt.

The researchers note the development of the infrastructure would enable electric vehicles to communicate intelligently with the power grid. This means that the times that charging can take place would be determined more efficiently. Danish officials have said that the charging times would be influenced by fluctuating power inputs to the grid from renewable energy sources, as well as a cumulative demand on the grid, at any point in time. A tenth of Danish vehicles could be electric or hybrid electric in the near future thanks to the market introduction and investment plans being made. (Renewable energy sources already generate 20% of the country's power.)

For this study, the partners will carry out the work in three phases: research, technological development and demonstration. The demonstration will be held on the Danish island of Bornholm in the Baltic Sea, the site of a large wind park. EDISON plans to match the wind-generated power on Bornholm with the power consumption of charging plug-in electric vehicles. By conducting their field test on Bornholm, the researchers will be able to assess how the energy system functions as the number of electric vehicles grows. It should be noted that the studies will be based on simulation and will have no impact on the island's security of supply.

The EDISON consortium consists of the Danish utilities DONG Energy and Oestkraft, as well as the Technical University of Denmark, the Danish Energy Association, Siemens of Germany, EURISCO (which is based on a European network of ex situ National Inventories (NIs) that makes the European biodiversity data available everywhere in the world) and IBM from the US.

For more, see: <http://www.dongenergy.com/EN/index.htm>; <http://eurisco.ecpgr.org/>

Climate change

The road to Copenhagen

Governments from 192 countries will attempt to thrash out a successor to the Kyoto Protocol next December in Copenhagen amid growing signals from scientists that global warming is occurring more quickly than expected.

Scientists across the world have been stepping up their warnings on climate change, saying glaciers are melting faster than expected, sea levels are rising more rapidly than ever and water supplies are drying up fast. But despite these warnings, world governments are still struggling to come up with a coordinated global response. The biggest challenge is probably to find a way of sharing global emissions reductions between rapidly developing countries, like China and India, and more industrialised regions, like the US and Europe, which are responsible for the bulk of historical CO₂ emissions. However, bridging those views will be anything but easy, as decisions by the United Nations Framework Convention on Climate Change (UNFCCC) have to be taken unanimously.

More than 190 government representatives agreed in December 2007 to work out a climate treaty by the end of 2009. The United Nations Climate Change conference will be the 15th UN Conference of the Parties (COP) and represents the last stage in global talks, launched in December 2007 in Bali, to clinch a deal on a successor to the Kyoto Protocol, which expires in 2012. Any new deal would need to come into force before January 2013.

Timetable:

- 1-12 June: UN climate negotiations, Bonn (Germany).
- 18-19 June: EU: EU summit to agree common position, Brussels (Belgium).
- 8-10 July 2009: G8 summit, La Maddalena (Italy).
- 28 Sept.-9 Oct. 2009: UN climate negotiations, Bangkok (Thailand).
- 7-18 Dec. 2009: Copenhagen climate conference (COP 15): Projected completion of UN climate negotiations on post-2012 framework.
- End 2012: Deadline for ratification of any new climate deal.

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