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Solar Promise

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Contents


6


18


34


38






POWER

Low Carbon Economies

POWER is a €5.8m inter-regional programme aimed at driving Low Carbon Economies to contribute towards meeting EU energy targets across seven European regions.

The programme is partly funded by INTERREG IVC and is led by the South East England Development Agency (SEEDA).

SEEDA is working in partnership with six other European organisations to deliver nine projects covering five themes:

- Energy Efficiency
- Renewable Energy
- Eco Innovation and Environmental Technologies
- Sustainable Transport
- Behavioural Change

The focus is on sharing best practice on low carbon economies throughout the participating regions. The projects respond to current needs within the regions they operate.

The project results will be fed back through a group of policy experts from across all seven regions. The outcomes will be analysed to ensure that good practices are captured and policy recommendations are fed back into the national and regional strategies.

POWER programme partners:

- Andalusian Energy Agency, Regional Ministry of Economy, Innovation and Science, Andalusian Government, Spain
- ARPA, Emilia Romagna, Italy
- Marshal's Office, Malopolska, Poland
- Province of Noord Brabant, Netherlands
- South East England Development Agency, England
- Stockholm Region, Sweden
- Tallinn City Government, Estonia

Get involved in the debate and learn more about the regions progress in this field through the POWER Policy Forum at: www.powerprogramme.eu

POWER Low Carbon Economies

European Union

INTERREG IVC
INNOVATION & ENVIRONMENT
REGIONS OF EUROPE SHARING SOLUTIONS

Foreword

The announcement by the European Commission of a new "Innovation Union" for Europe is hugely significant. It is also very timely, for as this magazine went to press nothing could be clearer than the fact that, for the energy sector, Europe needs a shove in the direction of greater energy security.

As winter looms, do we face another cold season of worry and energy shortages? Will major gas suppliers fall into dispute again about supply and availability? Many MEPs in the European Parliament have said that this situation is unacceptable. And while individual member states have been busy boosting their reserve and alternative supply capabilities, the Commission's lead in pushing for greater innovation is particularly welcome.

For greater innovation in European energy supply and consumption can only mean greater take-up of alternative energy resources. There is of course the research into carbon capture, clean-burn technologies and the controversial resurgence of nuclear, but for many people energy innovation means going green. It means making greater use of energy renewables.

And as two articles in this publication show, the key technology areas of wind and solar energy are both thriving. While some observers have cast doubt on their efficacy, other parts of the world are pressing ahead with large-scale take-up of such resources. Denmark's once proud lead in wind engineering is being rapidly overtaken as turbines are manufactured in the Far East at a scale of which Europe can only dream. As the wind energy article in this issue remarks, China is doubling its wind energy capacity every year!

While wind energy may be a reasonably mature technology, solar power is still evolving as photovoltaic-panel (PV) technologies advance. As is the case for wind power however, it will be industrial-scale manufacturing that makes the difference as Europe strives for its 2020 targets.

And this industrial scale of manufacturing is required just as Europe is in the depths of a financial crisis that is causing every member state to make deep cuts in spending across the board. Can industry still step up and produce the goods at prices that are affordable, even for small-scale energy producers such as cooperatives?

Industry would almost certainly say it could, if individual member states could speed up the planning and approvals process for new installations! It might be interesting to see what some can bring to the table at the first European Council meeting devoted to research and innovation, on 16-17 December 2010.

Philip Hunt
Managing Editor

Parliament and Commission unite behind calls for greater innovation

Philip Hunt

European Parliamentarians have been at the forefront of calls for greater energy efficiency in Europe for some time. The Commission recently responded to this and similar pressures with its call to arms for a new 'Innovation Union.' The Parliament subsequently hosted the EU's '"2nd European Innovation Summit' as this issue went to press.

Members of the European Parliament (MEPs) have long emphasised the need for greater efforts to overcome climate change and promote more energy innovation. Both the Parliamentary committee responsible for energy and many political groups have stressed to the European Commission that time is short if Europe is to build momentum in tackling climate change.

The Greens/EFA in particular have pushed the findings of the UN Intergovernmental Panel on Climate Change (IPCC), which posits that industrialised countries need to reduce their greenhouse gas emissions some 80-95% by 2050, if the planet is to have a 50:50 chance of limiting global warming to 2°C.

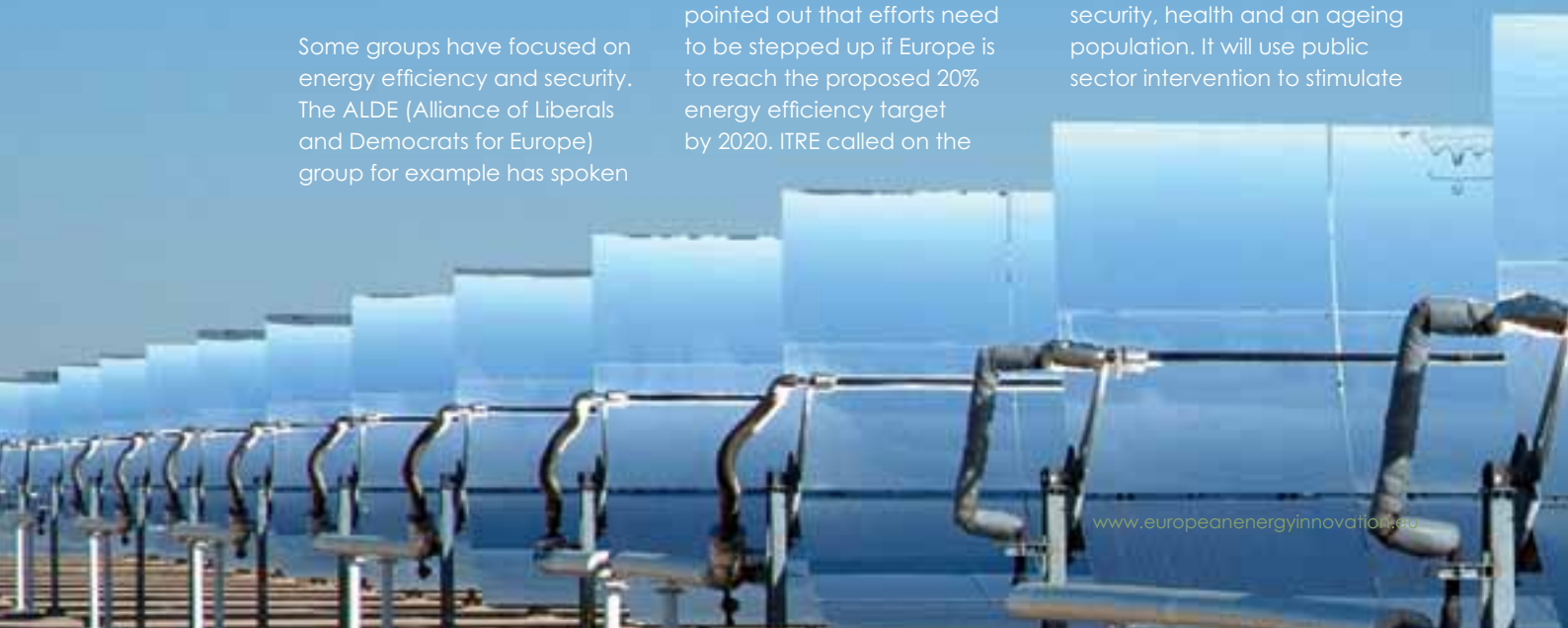
Some groups have focused on energy efficiency and security. The ALDE (Alliance of Liberals and Democrats for Europe) group for example has spoken up for transparency, choice and competition in Europe's energy market, in order to improve security of supply and reduce dependency risks.

"Every winter reminds us of Europe´s dependence on gas supply from Russia, Ukraine and others," said the ALDE spokesperson on energy security Adina Valean on 21st September. "Security of energy supply has become a priority for the EU … we still need to continue diversifying energy routes and supply sources to facilitate competition, access and choice."

The European Parliament Committee on Industry, Research and Energy (ITRE), in its report on the Commission's Energy Efficiency Action Plan (of 23rd September 2010), pointed out that efforts need to be stepped up if Europe is to reach the proposed 20% energy efficiency target by 2020. ITRE called on the Commission to propose binding energy-efficiency targets for member states, and a revision of the Energy Services Directive to include a scoreboard approach on their efforts to do so (both of which the Commission has responded to). It also requested a stronger focus on innovations such as smart grids, smart metering and energy storage.

BUILDING AN 'INNOVATION UNION'

Which is why most MEPs have responded positively to the Commission's 06/10/2010 announcement (see elsewhere in this issue) of a strategic approach to EU innovation driven at the highest political level. The new "Innovation Union" will focus Europe's efforts on challenges like climate change, energy and food security, health and an ageing population. It will use public sector intervention to stimulate



the private sector and remove the bottlenecks which stop new ideas on climate change, energy and food security from reaching the market.

The Commission's statement was applauded by the European Conservatives and Reformists group in the Parliament. Malcolm Harbour MEP, chairman of the Parliament's internal market committee, responded that, "For too long, innovation has been seen as an optional extra for policymakers, nice to have but difficult to do."

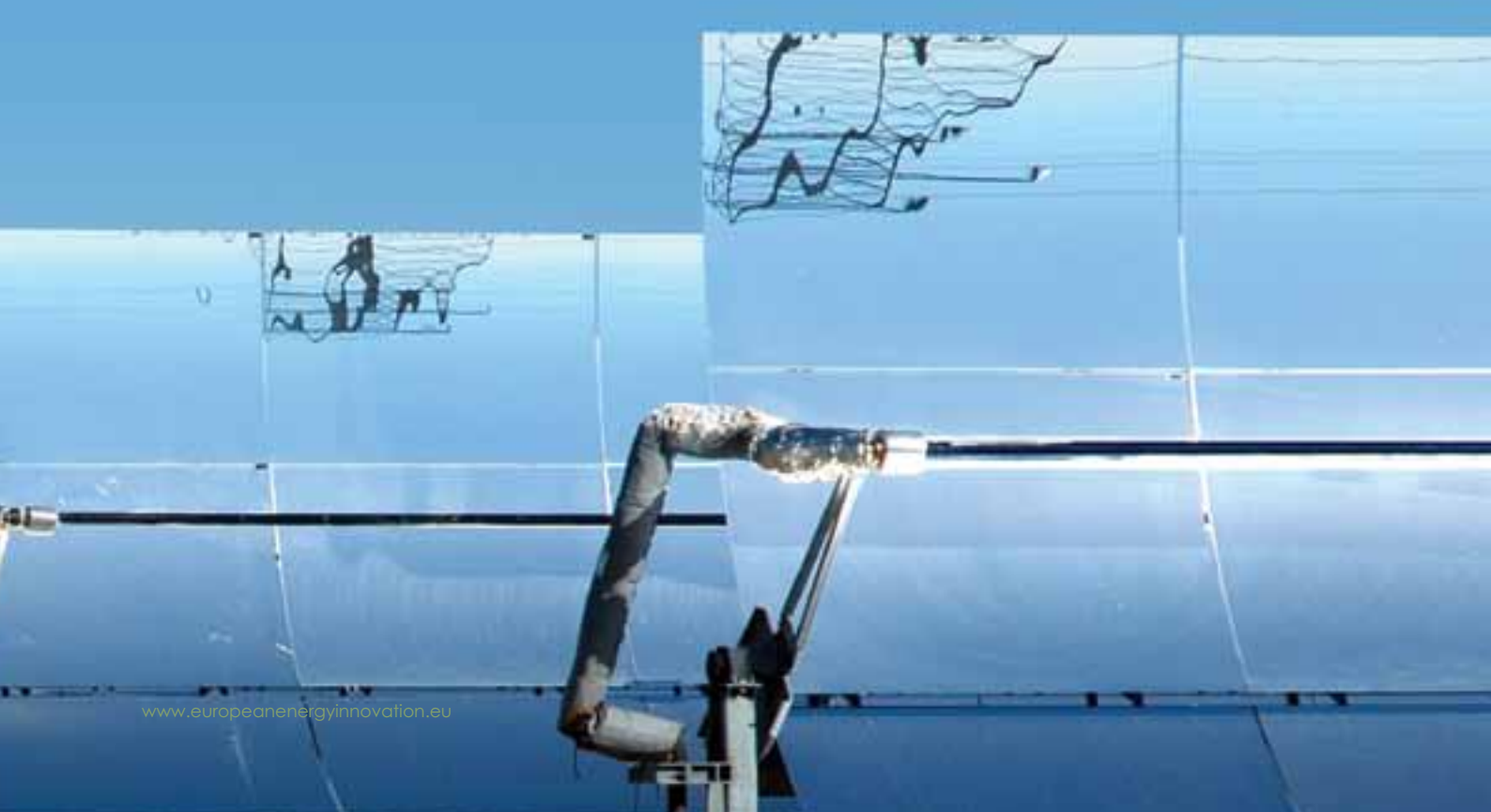
"This plan shows how Europe is in danger of falling behind our global competitors, by failing to translate our research knowledge into profitable, job creating enterprises," he said. "I particularly welcome the plans to promote the role of public procurement as a driver of innovation and a lead customer for innovative enterprises."

EUROPEAN INNOVATION SUMMIT

The announcement immediately preceded the organisation of the European Innovation Summit on 11-12 October 2010 (as this publication went to press). Held at the European Parliament by knowledge4innovation (the K4I Forum of the European Parliament, (www.knowledge4innovation.eu), the event covered efficient energy provision and EU/Russia innovation cooperation, as well as topics such as eSkills, Europe's future Nobel prize winners, sustainable food security and healthy ageing.

While the Innovation Summit is likely to help raise awareness and build consensus among a variety of stakeholders, some MEPs believe that there is plenty of room for further improvement. The Greens sponsored a groundbreaking study on renewable energy in Europe by the European Climate Foundation , which was released in April 2010.

The study proposed that a target of 100% renewable energy in the power sector was within reach. Green MEP Claude Turmes, president of the EU's network of parliamentarians for renewable energies, said that, "a European power sector based entirely on renewable energy is not only possible but is clearly in Europe's interest. This study, which is based on conservative estimates, shows that producing 80% of European power from renewable energy by 2050 is not only possible but also not more costly than risky alternatives such as carbon capture and storage and nuclear. It is clearly high time for the EU to get its energy policy priorities right."



ELTIS – Europe's N°1 information platform on urban transport

The efficient movement of people and goods is one of the main challenges facing most European towns and cities today. Many initiatives to improve the mobility of people and the distribution of goods in an economically and energy and environmentally efficient manner have been launched over the past years. In an attempt to exchange experiences, a great deal of information has already been published on the Internet and project reports, yet it is often inconsistent and hard to find. There is a pressing need for a comprehensive online information portal.
ELTIS — the European Local Transport Information Service — is a response to this need.

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www.eltis.org

An initiative of the Executive Agency for Competitiveness & Innovation (EACI), ELTIS enables the exchange of information and experience in the field of urban transport and mobility. It is designed for everyone involved in improving mobility, transport efficiency and safety as well as reducing the energy and environmental impacts of transport. It is particularly useful for authorities and technical staff at municipalities as well as for managers and policy-makers and transport operators. The comprehensive website of ELTIS which already exists for more than 12 years contains currently the following:

- news on urban transport and mobility;
- policies and initiatives of the European Commission
- open project calls and tenders
- tools for practitioners
- training offers and training materials
- case studies on urban transport and
- teaching and learning materials.

Currently ELTIS is in a comprehensive re-design process. Not only the layout and appearance will be radically changed based upon the user needs but also the contents will be enriched. Besides the website's flagship case studies (currently more than 1700 case studies available) and the news section (currently 2 news items per day published) additional new features like the following will be provided:

- Video case studies
- Statistics
- Gallery of photos for everyone to use
- Legal aspects
- Funding opportunities
- Job offers.

The website will be available in eleven European languages. Long lasting contents will be translated and the most important and successful case studies will be translated into all EU languages. The re-launch of the new ELTIS website is planned for December 2010. Until then all services are available as before free of charge from www.eltis.org.

Innovate – or face energy imports and shortages The Commission's view

Philip Hunt

Europe needs to radically change its energy consumption and generation habits if it is to maintain its present living standards or society. Indeed, if it is to retain any kind of independence of action in the world at all! Since 2009, the European Commission has been driving numerous innovation actions to this end.

In 2030, the European Union will face energy imports amounting to 59% of total consumption. And it will still require 40% more gas to be imported than in 2005. These are two of the stark figures presented to the European Union and its national governments in the European Commission's 2009 Baseline scenario for EU energy development.

These findings assume that present EU energy trends and policies continue. Even with increased efforts to improve energy efficiency at both European and national levels, the figures will not change enormously.

This striking "imports and shortages" scenario is what is driving the European Commission's emphasis on "decarbonising" Europe's energy generation and consumption. Its strategy to nudge Europe towards change in energy generation and consumption patterns has been developing since 2009. The objective? 20% of EU energy consumption from renewable resources and 20% less greenhouse gas emissions by 2020.

INITIATIVES AT EUROPEAN, NATIONAL AND LOCAL LEVELS

The Commission has taken a broad-front approach to achieving this 2020 target. National Renewable Energy Action Plans (NREAPs) from each EU member state map out that country's roadmap to meeting its (binding) renewable energy target for 2020. And a wide range of regional and local energy innovation initiatives are under way.

While no less than three European Commission

directorates, Energy, Climate Action (new in 2010) and Environment, have an interest in energy use and innovation, the work of DG Energy lies at the forefront of many innovation initiatives. Energy innovation programmes are already in place at European, regional, national and local levels.

Key DG Energy actions include Sustainable Energy Europe, which aims to spread best practices and build alliances among sustainable energy stakeholders. Another, ManagEnergy, supports energy efficiency and renewable-energy efforts within the countries and regions.

The online BuildUp portal, already up and running, provides information to building professionals, public authorities and building owners on how to implement energy-saving measures in buildings. While the Covenant of Mayors is a commitment by signatory towns and cities to go beyond EU energy objectives in CO2 emissions through greater energy efficiency and clean production techniques. Launched in 2008, the Covenant has gone from strength to strength and has more than 500 cities under its banner.

How eu predictions of energy generation methods have changed

Wind energy	**136GW**
Other renewable energy	**76.5GW**
Gas	**55.6GW**
Coal, solid fossil fuel	**41.6GW**
Nuclear	**14.3GW**
Oil	**9GW**

EUROPEAN ENERGY PROGRAMME FOR RECOVERY (EEPR)

One of the biggest action programmes is the European Energy Programme for Recovery (EEPR), which aims to speed up investments in energy infrastructure and technology projects while improving security of supply. EEPR includes 43 major energy projects that are expected to significantly contribute to EU economic recovery as well as improve energy efficiency.

The "CCS Project Network" is one such project. Announced on 17th September 2010, it is the world's first network of CCS demonstration projects that will foster knowledge sharing on carbon-capture technologies, a key component in efforts to cut CO2 emissions (significant especially for the EU's still relatively large number of coal-fired power stations).

The network aims to accelerate learning and ensure that CCS fulfils its potential as a commercially viable technology. Each participant is required to disseminate their research results as widely as possible, in order to create a highly visible cluster of projects helping to achieve market viability by 2020 (see http://www.ccsnetwork.eu/).

While views on the viability of future CCS technologies vary at present, the Commission sees CCS as an important plank in its bridge to a CO2-neutral future. Energy Commissioner Günther Oettinger believes that, "CCS is one of the key technologies that we need to develop


Commissioner Oettinger

today to make the necessary deep cuts in carbon dioxide emissions from the energy sector in the coming decades. …. Knowledge sharing will be essential for accelerating the deployment of clean energy technologies in Europe and worldwide."

INTELLIGENT ENERGY EUROPE (IEE)

Another of the larger EU actions guiding Europe towards a brighter and more energy-efficient future is the Intelligent Energy Europe [IEE] programme, which forms part of the EU's Competitiveness and Innovation Framework Programme (CIP). IEE seeks to bridge the gap between EU policies and how they impact on the ground.

The IEE's global budget of €730 million is supporting a range of European projects on energy innovation, funding up to 75% of eligible project costs. The programme already manages over 400 projects, has established 60 new local or regional energy agencies and involves over 3,000 organisations across Europe.

An interesting example of the way IEE works is the SMART SPP project, an initiative that focuses on sustainable procurement. SMART SPP seeks to promote new low-carbon emission technologies and integrated solutions on the European market. It does so by encouraging early market engagement in the pre-procurement phase of public tenders between public-authority procurement departments and developers/ suppliers of innovative products and services.

The project partners are developing a standard approach to pre-procurement of emerging technologies, an approach that includes managing the risks in pre-procurement, assessing the financial benefits (life-cycle costing) and calculating C02 savings. The project's main effort is in three key areas: lighting systems (e.g. LED lighting, OLED-lighting, lighting tubes), high-efficiency electric vehicles, and construction services (heating/cooling systems that use renewable energy sources).

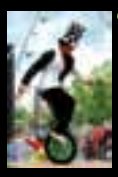
Although SMART SPP is not due to complete until July 2011, the first tools and user guides are already available to download from the project website (www.smart-spp.eu/). A practical guide explains how a public authority can encourage energy-efficient innovation through public procurement, while the accompanying Excel tool calculates life-cycle costs (LCC) and CO2 emissions in procurement. Beta versions are available in four languages (English, Spanish, Portuguese and Danish).

get emotional

about sustainable transport!

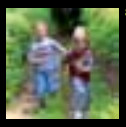
raising the **image** of cycling

rituals provide structure



stories and expieriences

pleasing the **eye**



children **guide** parents

Trendy Travel's main objective is to achieve a modal shift from the car to healthier, more eco-friendly transport modes by making sustainable transport more emotionally appealing with following approaches: **STORYTELLING >** absorbing stories created to capture listeners, viewers and readers are self-perpetuating **RITUALS TO PROVIDE STRUCTURE >** bicycle events throughout the year become an integral part of activities organised by the city administrations **RAISING THE IMAGE OF CYCLING >** the idea that cycling is a means of transport for poor people will be dispelled, particularly in the New Member States **PLEASING THE EYE >** interesting design for sustainable transport, and **PARENTS ARE TOUCHED >** children guide their parents towards sustainable transport. In the short term Trendy Travel aims to accomplish a positive perception and attitude towards sustainable transport and energy savings through a modal shift. In the long-term the propagation and expansion of the above policies throughout Europe and beyond should be achieved.

trendy travel

www.trendy-travel.eu

Supported by Intelligent Energy Europe

Photos: Cork City Council & Cork Environmental Forum (No. 1, 4, 5, 8, 9), FGM-AMOR – Austrian Mobility Research, (No. 2, 3, 6), John Dowes / Cork City Council (No. 7), Graphic Design: FGM-AMOR

Hamburg – Green Capital 2011

Michael Edmund

The motto "The whole city joins in" was adopted by this Hanseatic city when it was elected European Green Capital for 2011. Acknowledging this accolade, Senator for the Environment Anja Hajduk emphasised a principle that goes right to the heart of the city's year in the spotlight; that economic development and environmental protection should go hand in hand.

As 2011's Green Capital, Hamburg will present a programme of initiatives involving the whole city. A programme designed to present to Europe a "booming industrial, commercial and service metropolis, capable of leading the way in climate and environmental protection".

Under the initiative "Visions for the City of the Future", a broad range of government bodies, public companies, business chambers and educational and research institutions will come together to showcase sustainable environmental policies and projects. Hamburg's citizens have also been invited to contribute their green ideas and suggestions.

The focus for these 'Green Capital' activities will be the Infopavilion, which will house Hamburg's 2011 Green Vision presentation and display a variety of related exhibitions. A permanent exhibition will also be established to mark Hamburg's environmental effort and achievements. But the city intends to take its green message even further, by creating a Europe-wide platform for the exchange of ideas between experts and citizens.

Hamburg's programme includes environmental tours that will enable citizens and visitors alike to see at first hand its environmental practices. Whether walking, cycling or on public transport, people will be able to explore a broad range of outstanding environmental projects.

And if you are not able to visit Hamburg, then Hamburg might just be able to visit you! The city is planning a "Green Capital on wheels" - sending a train to around 15 cities throughout Europe including Vienna, Zurich, Antwerp and Malmo. The train, hosting a modern interactive exhibition, will be used to share experience and best practices.

Smart vehicle communications improve road safety

In the future, cars stuck in traffic or on slippery roads will be able to communicate with other vehicles and road operators. In a bid to cut down on traffic jams and road accidents, the priority of the "eSafety observatory" (Escope) project was to bring the benefits of eSafety to all road users.

The road system network envisaged by the eSafety initiative will promote the use of smarter, safer and cleaner road transport. And it comes not a moment too soon.

Europeans already spend a quarter of their driving time in traffic jams and it will get much worse before it gets better. More importantly, every year, nearly 40 000 people are killed in road accidents in the European Union and more than 1.5 million injured. The "road toll" statistics can be overwhelming, and may even obscure the fact that each case is a personal tragedy.

As part of the effort to accelerate the development, roll-out and use of vehicle safety systems, the European Commission funded the establishment of the "eSafety observatory" (eScope). Its aim was to strengthen and harmonise the activities of the automotive industry working on the introduction of "co-operative" systems for smart vehicle communications.These intelligent systems which enable vehicles to communicate with each other and road infrastructure operators are based on wireless technology. Warning other drivers of adverse road conditions or of a crash which has just happened are just two examples of how this technology can contribute to reduce road accidents and traffic jams.

The eScope project partners worked with high-level advisers and experts as well as industry representatives from across Europe to follow the progress made on yet anothe eSafety solution. The pan-European in-vehicle emergency call, eCall is a system by which, after an accident, a car can automatically call the rescue services and transmit location data, reducing the response time. In principle the technology is available. But there are legal, budgetary and coordination problems to overcome before it can be implemented in all Member States. Discussions carried our during the Escope project made clear that although the problems differ between Member States, together they delay their implementation.

In 2006, Escope organised the launch of the "intelligent car initiative" at which several technologies were showcased in front of decision-makers. It also created a publicly accessible database on eSafety systems and comprehensive reports on the progress contributing to the achievements of the eSafety objectives.

The first decisive steps towards meeting the European goal of road accidents seem to have been made. Still, the investment in smart vehicle communication systems by the automotive industry will need to be met by public funding in essential roadside infrastructure. Only then will the lives of European drivers will be safer.

Illustration courtesy of European Telecommunications Standards' Institute (ETSI)

Project funded under the FP6 programme IST

Source : Research EU

Printing batteries

The aim of the project is to design a printable Li-Ion-Cell. In addition to the electrochemical aspects the production technology shall be covered leading to a pilot production.

The Greenbat battery will be a Li-ion battery printed layer by layer (See Figure 1), based on the LiFePO4 (positive active material)/ graphite (negative active material) using a polymer electrolytic separator. Its overall dimensions (without the snap contact) were imposed by the Plastic Electronics application, i.e. 40 x 40 mm. In these conditions, the nominal capacity of the battery should be about 30mAh.

The works led on the printing of the graphite based negative electrode showed that the formulation developed in water and using a binder latex/CMC is printable at the lab scale, in conditions that some adjustments on the solid content, so on the ink viscosity are made. Of course, in parallel, the adjustments of the printing process (printing pressure, speed …) were also realised. Thus, the negative electrode print by R2R process should be easily envisioned as proved by the VTT trials.

Concerning the positive electrode, the development may be more complex. Indeed, for electrochemical reason, the positive inks are usually formulated in organic medium, because the used binder (which has to withstand high potential) is not soluble in water. But the objective of the Greenbat project is to propose to develop aqueous inks, because greener. Consequently, the following strategy of development has been adopted: CEA and IC jointly test new aqueous binders (available on the market or to be synthesised) through their physical-chemical and electrochemical characteristics and implement them in LiFePO4 based inks. Thus from printing and cycling tests, the best one will be able to be selected and improved. In parallel, the organic solution will be developed to be printable in order to be used as back up solution, in case of cycling tests with no aqueous binder appears possible. At the moment, some candidate aqueous binders are testing. The preliminary results seem promising. However, cycling tests on a long time are necessary to evaluate the electrochemical stability of the inks.

The development about the print of the membrane directly onto the negative electrode has been largely engaged. Two solutions are in progress:

- a completely innovative solution based on the used of alkyl derived ethers or carbonate monomers. The investigations were so launched in order to synthesise these products, but also to find the preparative route which will be scalable to allow the synthesis of sufficient quantities of materials to formulate and test inks with.
- a solution based on PVdF based membrane because this polymer is well known for its electrochemical behaviour in Li-ion technology. Thus, the principle of elaboration for a PVdF based membrane has been identified: the membrane elaboration will be managed by selective evaporation, using a non solvent of PVdF, i.e. water and a "clean" organic solvent. The difficulties induced by the negative electrode used as substrate have been revealed and identified and first solutions are in progress. Today, the first tests have shown that it is possible to print a membrane on a negative electrode (Figure 2, trials realised by screen printing)

Figure 1: Principle for manufacturing the fully printed Li-ion battery

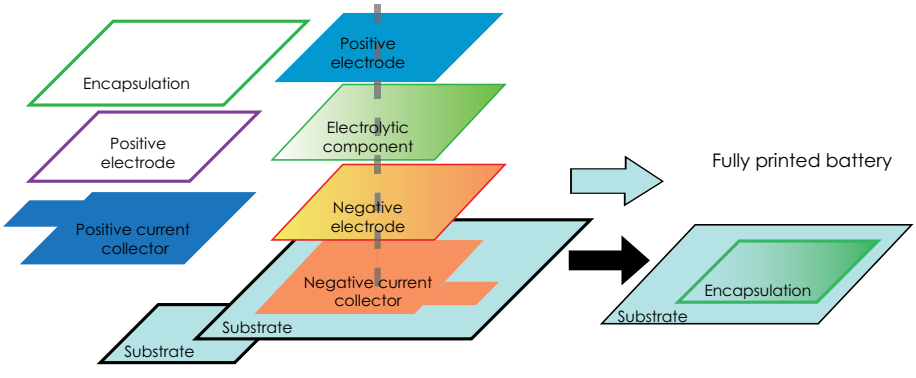
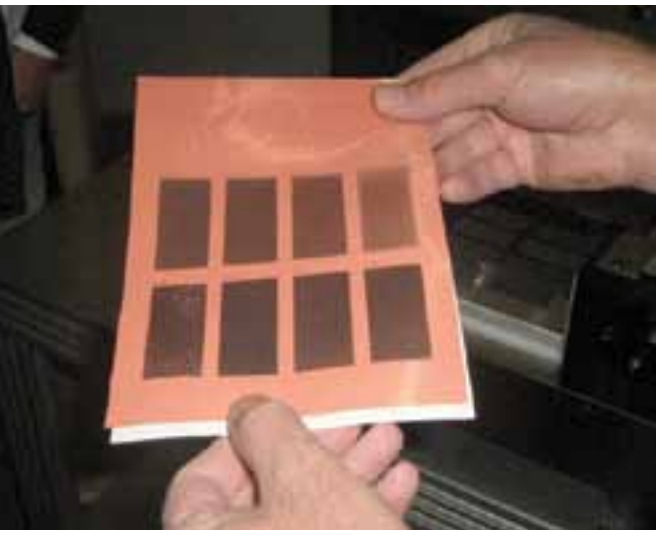


Figure 2: Printing tests performed at NSMZ with CEA negative ink



A new class of polymeric binders has been developed employing a versatile copolymer approach which allows to tune solubility behaviour and allows for postprocessing modifications such as additional crosslinking. The composition of these polymer can be tuned by adjusting the feed ratio of the comonomers. Ratios have been identified which makes these binder polymers water soluble while being insoluble for typical electrolyte solvents such as EC and PC. Crosslinking chemistry for these binders has also been developed and is suitable for thermal radial as well as photochemical crosslinking. As these binders contain carbonate functional groups they should provide benefits in regard to ion conduction within the porous matrix of the complex LFP particle matrix.

Intriguing progress has been made on new materials which can be used to directly print separators (membrane) pre-filled with the required electrolyte solution. This concept will have beneficial implication in the assembly (processing/ printing) of thin film batteries by reducing the number of processing steps needed overall and is also expected to save energy as a processing solvent does not need to be removed to achieve the formation of a porous morphology. The separator membrane can be printed and cured under thermal and photochemical conditions, where the latter options will be favoured as it can be included as a fast production step. The separator membranes can be obtained with porosities of 70-80% and the process is compatible with the use of typical electrolyte formulations and can be extended to the use of ionic liquids as potentially greener electrolyte alternatives for future developments. A patent that covers the process and materials involved has been filed.

In parallel with the investigations on materials, the whole consortium has engaged intensive reflexions on the process flow sheet. Thus several constructive discussions during technical meeting and emails exchange allowing drawing a first draft of the process and enlightening difficulties to be overcome. For instance, the chronological order for printing the different layers has been treated. Printing trials were also undertaken at NSMZ (Figure 3) in order to dimension some printing tools, then to have some tracks for well connected the different units of the process and eventually to integrate intermediate steps. Some discussions about the electrolyte filling step as the final step of packaging were also held. Further these different exchanges, for instance Plastic Electronic has provided some functionalised substrates to CEA, in order to evaluate their potentiality to be used as packaging.

Pursuant to the implementation of a brassboard prototype early in the project (08/09), first registration tests were carried out (08/09) and many details of process including first printing experiments on NSMZ industrial equipment were carrid out (NSMZ workshop, 08/11) and NSMZ embarked on a first lab printer design.

This design would address four printing issues:

- smooth electrode surfaces for minimal electrode-electrode spacing and to minimize voltage gradients
- multiple-pass gravure and flexo advantageous, particularly for lower-viscosity inks; however, screen till needed as a thick-film printing process
- if multiple-pass gravure or flexo, far more ink to be deposited per pass
- printing of separator advantageous.

The new design has inherently better registration and obvious capability for multiple-pass wet-in-wet printing. In the longer term, (with a longer and

carefully controlled endless tape), in-line curing may be included. Moreover, some simple tricks achieve adequate registration; and in the longer term, much-improved registration could be achieved using industrial strength Web-control technologies.

First tests are being conducted on this machine, and these lead us to believe that 20 µ per pass or thicker can be achieved while preserving smooth film surfaces.

A longer-term step will be to use this device in an in-line, R2R fashion, e.g. as a replacement for a flexo anilox; that is, to coat a flexo cliché in this way and then to print with it.

It is also important to investigate the practical aspects of battery printing in a pilot scale alongside the work made in laboratory because roll to roll process states some unique requirements for manufacturing process. GREENBAT consortium has made this type of research with VTT's modifiable ROKO pilot printing machine. For example functional anodes and cathodes have been printed in mass production like manufacturing environment.

Finally, we corresponded with a large number of parties to investigate practical printing issues, particularly regarding the printing of such thick films and wide variety of inks; separator printing, including but not limited to printing the separator from a polyHIPE. The latter raised some very interesting curing issues including a new case for photocuring; as well as other print-related aspects of membrane fabrication and funtionalization.

So, after period 2 of the GREENBAT project the consortium is on the best way to achieve the objectives. The third period will be used to integrate all improvements found up to now and print and test the first samples of the GREENBAT.

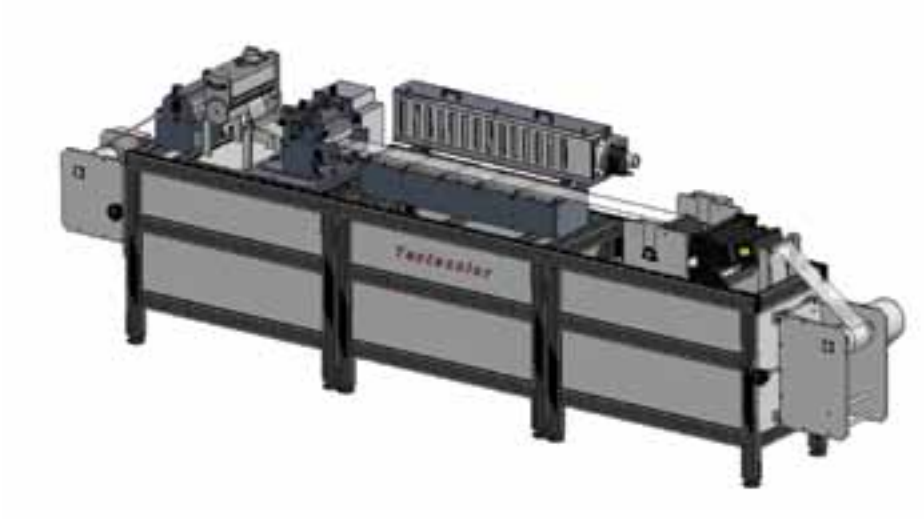


Figure 3: Brassboard prototype printing platform

Figure 4. Modifiable ROKO R2R printing machine

Goodbye petrol

To achieve progress in research on the second generation of biofuels, Europe is launching the NEMO project which is counting on enzymes and micro-organisms to convert agricultural and forestry waste into the fuels of the future.

In 2020, 10 % of the fuel consumed for transport in Europe should be of renewable origin. To achieve this goal, the EU has just acquired a new tool, the Novel high-performance enzymes and micro-organisms for conversion of lignocellulosic biomass to bioethanol (NEMO) project, coordinated by Merja Penttilä, a researcher at the Valtion Teknillinen Tutkimuskeskus (VTT), the Technical Research Centre of Finland. This aims to facilitate production of second generation biofuels from agricultural and forestry waste. This is in contrast to first generation biofuels that, apart from having a questionable ecological balance, are often made from food products such as cereals and thereby add to price pressure on these resources and threaten the social and political stability of the poorest countries. (1) While the EU wants to guarantee its role in this field of strategic research, it is also counting on new projects of this kind to improve its future energy independence.

ECOLOGY GOAL

No fewer than 18 partners in nine European countries (Germany, Belgium, Finland, France, Italy, the Netherlands, Slovenia, Sweden and Switzerland) are partners in the NEMO project with its mix of universities, research centres

and private companies such as Green Sugar, a small business based in Germany. "Thanks to our contacts with Frankfurt University (DE), we were invited to a NEMO project meeting, where we were able to see that we had converging interests," explains Frank Kose, project leader at Green Sugar.

The research budget, scheduled over four years, is EUR 8.25 million, 5.9 million under the Seventh Framework Programme's "Food, Agriculture and Fisheries, Biotechnology" theme that is concerned with development and the bio-economy.

The second generation biofuels that NEMO aims to develop are based on the use of plant lignocellulose. As this is found in all plant cells it means that the whole of the plant can be used, thus stems and leaves, residue (straw) and green waste when plants are cut or pruned. The edible part of the plant is therefore no longer the only part that can be used to make biofuel. This effectively ends the 'eat or drive' alternative inherent in the first generation. What is more, using plant waste in this way offers economic benefits.

CONVERTING GREEN WASTE

The researchers will seek to develop new ways of converting the lignocellulose (consisting of lignin, cellulose and hemicellulose) present in agricultural and forestry waste into liquid biofuel. This will normally be done in four stages: preprocessing, extraction, fermentation and distillation.

The preprocessing of lignocellulose serves to break down the very solid lignin to extract cellulose and hemicellulose molecules and obtain glucose from them. Fermenting the glucose using yeast then produces ethanol, an alcohol that when distilled will be used to produce the biofuel.

NEMO will concentrate essentially on the first stage. "Its main objective will be to convert the cellulose and hemicellulose carbon chains into simple sugars such as glucose, using new types of enzymes. This is known as saccharification," explains Frank Kose. These enzymes are proteins that speed up the chemical reactions and make it possible to convert molecules into different molecules. The other advantage is that these have a low toxicity for the microbes that control the glucose fermentation. "For each enzymatic approach it is necessary to carry out a preprocessing to prepare the biomass for the action of the enzymes. The technology developed at Green Sugar, which is based on the use of inorganic acids, could increase their efficiency," explains the project leader.

In addition to its scientific aims, NEMO is also seeking to verify that the enzymes that come out of the laboratories will be sufficiently effective to be used in industrial processes of interest to companies. "Our commitment is of course motivated by economic considerations," explains Frank Kose. "We want to develop a saccharification technology that, in the future, can be installed in factories able to produce between 50 000 and 100 000 tonnes of sugar a year. To achieve this goal, we need major industrial partners. If NEMO develops a new technology to convert cellulose using enzymes and if this includes the Green Sugar technology, industrialists involved in the project will use this and for us that will amount to selling our know-how".

It is in this way that NEMO is attracting the interests of industry as well as research. Because, in addition to hoping to help resolve the global energy problem, it is also a question of winning a share of the biofuel market, a fast-growing sector of the economy. What is more, not waiting for NEMO to realise its promises, a third generation of biofuels is already beginning to take shape. Based, among other things, on the extraction of oils from algae, this technology is also trying to emerge from the confines of the laboratory.

The 'Food, Agriculture and Fisheries, Biotechnology' Theme

With a budget of EUR 1.9 billion, this is one of the themes under the Seventh Framework Programme's specific Cooperation programme. Its main aim is to create a European growth bio-economy based on a sustainable model and a good management of biological resources. Among other things, it involves converting the biomass into products with a high added value.

Source: Research EU

Backing a Bioenergy Winner – which technologies will the EU support?

At present, around 9% of the total energy consumption in Europe is derived from renewable sources, and an ambitious target of increasing this proportion to 20% has been set for the year 2020. The importance of the biomass sector to this plan can be seen from the fact that, with around 100 Mtoe, it currently accounts for two thirds of all renewable energy, and is expected to provide at least half of the 2020 target.

As the European Member States submit their national Renewable Energy Action plans, the European Union is preparing two proposals to support innovative bioenergy and renewable energy technologies in pursuit of the 2020 objective. These proposals are the European Industrial Bioenergy Initiative (EIBI) and NER300.

EIBI – ACCELERATING COMMERCIAL DEVELOPMENT OF BIOENERGY

One of six initiatives proposed within the European Strategic Energy Technology Plan, the EIBI has been conceived in support of the 2020 target of deriving 14% of Europe's total energy requirements from sustainable bioenergy. Four initiatives relating to wind and solar power, electricity grids and Carbon Capture and Storage (CCS) were launched in Madrid in June 2010, and it is expected that the Belgian presidency will launch the bioenergy initiative in November 2010, when it will also issue a call for projects.

The estimated budget, 8 billion euro over 10 years, will be used to support up to 20 projects such as large scale advanced bioenergy and advanced biofuels "for which the barriers, scale of investment and risk can best be tackled collectively by the EU, Member States and industry".

In order to identify candidate technologies suitable for EIBI funding, a value chain approach has been used to assess their innovative nature and the reliability of both biomass sources and product markets. Currently, seven technologies have been identified, including the production of synthetic fuels, biomethane and power from gasification; of ethanol, hydrocarbon and bioenergy from certain particular biomass sources; and bioenergy carriers via thermochemical processes.

NER300 – PUSHING CARBON CAPTURE AND STORAGE (CCS) ALLOWANCES

The allocation of CCS allowances to innovative renewable energies that are not yet commercially viable represents an excellent opportunity for bioenergy plants. The European Commission will publish a call for proposals either towards the end of September or in October 2010, and EU financing could cover up to 50% of the eligible costs of suitable projects.

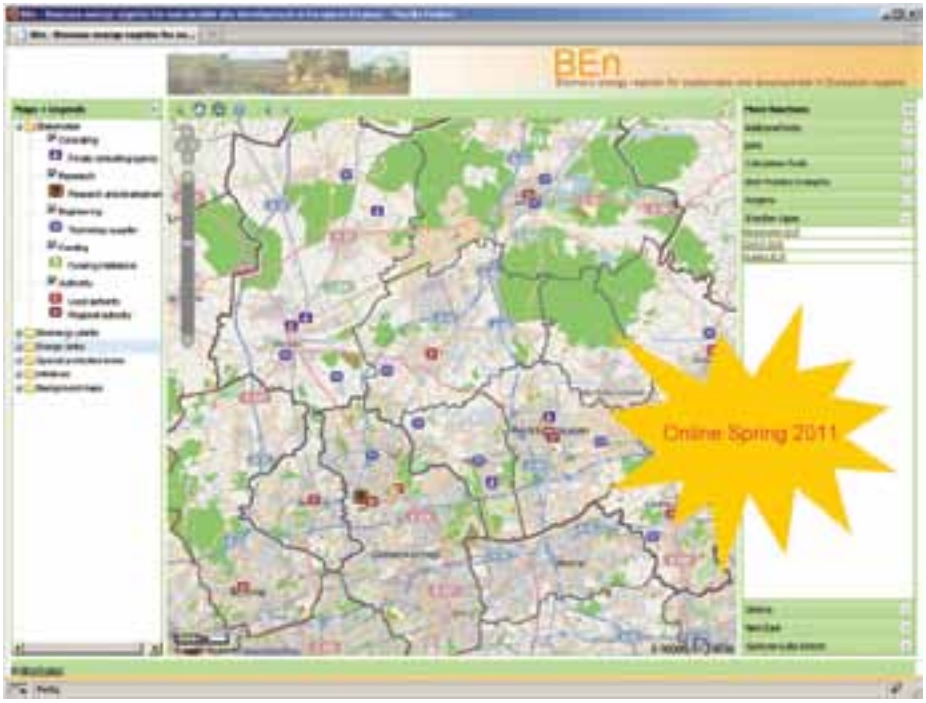
Furthermore, seven bioenergy categories will now become eligible for NER300 funding if the production of biofuels meets the sustainability criteria defined in the RES directive. These include the technologies based on lignocellulose, algae, the use of household waste materials to produce power, biofuels and biogas when it is produced by pyrolysis, torrefaction, gasification, biological or chemical processes. ●

Source: Edita Vagonyte, AEBIOM. vagonyte@aebiom.org

BEn

Biomass energy register for sustainable site development

Europe, facing the challenge of climate change, targets significant cuts in carbon dioxide emissions in response. Consequently, local authorities, regional planners and stakeholders in industry throughout Europe are committed to the development of renewable energy policies. The utilisation of biomass as an energy source which is locally available and storable offers an opportunity to actively shape energy planning processes on a regional level. Currently, the lack of detailed data, specifically on the energy demanding site, is a significant constraint to sustainable development in the bioenergy sector.



It is precisely in this field where the project BEn supports local communities and regional stakeholders through the development of an easy-to-use tool for local energy planning. The core objective of this project is the development of a regional energy register indicating regional energy sinks as well as biomass sources for energy production. The data structure is designed to be transferred and displayed in a web based geoinformation system (GIS). The energy register in form of an online GIS mapping service together with regional masterplans and regional bioenergy guides will facilitate the planning and discussion in the field of energy policy between different regional stakeholder groups

The BEn project is co-funded under the IEE – Intelligent Energy Europe programme for a period from November 2008 to October 2011 (www.ben-project.eu). Seven partner organisations from five countries are collaborating on the project performance in four model regions: North East England/ UK, Emscher-Lippe Region/ Germany, Umbria Region/ Italy and the Gostynin Lake District/ Poland.

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Czech Biogas Association

Czech Biogas Association (CzBA) has become a national technology platform in the field of biogas. It associates experts and other parties concerned in production and utilisation of biogas including R&D, informs about related technologies, provides important and verified knowledge and approaches and develops relations to public bodies and authorities.

CzBA has actually over 40 members including four leading R&D institutions, biogas plants´ operators, engineering companies and other industry players. CzBA was a co-founder of European Biogas Association (EBA) that unites a large number of the most experienced biogas experts in Europe and has highly experienced and skilled staff providing policy advice, know-how and information to promote beneficial legislation and framework conditions in the field of biogas member of Czech Gas Association and member of several other related platforms (in the field of NGV, chemistry, biofuels, etc.).

CURRENT STATUS AND OVERVIEW OF THE BRANCH

The biogas production in the Czech Republic has a long tradition. The first biogas plants were constructed in 1960's.

Table 1. Biogas plants in the Czech Republic (January 2010)

Biogas production with CHP gas utilisation	No. of plants	Installed power [MW]
Agricultural biogas plants	91	56.64
Sewage gas	57	18.89
Landfill gas	61	23.02
Total	**209**	**96.55**

The initial development of anaerobic digestion was bound to organic waste processing and stabilisation. This included both the waste water treatment plants (WWTPs) and agricultural biogas plants. WWTPs utilised the biogas-forming process in sewage sludge stabilisation, the final process of removing the organic matter from the sewage water. The agricultural biogas plants were following this scheme, and during the 20th century they were installed as the manure processing services at large centralised pig, cattle or diary production facilities. In both these cases the forming biogas was utilised mainly in process heating (WWTPs) or space heating (piggeries). Only the minor part was utilised in combined heat and power production (CHP).

The second historical development milestone was set up by the new Renewable Energy Act (REA 180/2005 Sb.) in 2005. This modern legislation supports renewable energy utilisation in order to fulfil all the national and European targets. The Czech legislation supports production and utilization of agricultural biogas, sewage gas and landfill gas. Whereas the sewage gas production is bound to WWTPs, the major developments have started in the field of agricultural and landfill gas production and utilization.

The agricultural biogas production and utilization has started in early 2007, when the first 'classical' agricultural plants were started up. The term 'classical' indicates the

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utilisation of dedicated biomass production in addition to manure treatment. Agricultural biogas plants develop quickly since then. Nearly 40 new agricultural biogas plants have been constructed annually during the years 2008 and 2009. In January 2010, there are 91 agricultural biogas plants with a combined power output of 54 MW_{el}.

The Czech Republic target on European renewable energy share in 2020 was set up on 13%. Current share accounts to about 6% (2008). Biogas share on total renewable production is showed in the following table (Table 2).

The boom of agricultural biogas plants in the Czech Republic has started early 2007. Biogas production and utilisation in CHP´s gains important position among other renewable energies. The electricity production during the year 2009 represents the graph (Graph 1). It clearly shows constantly increasing production through the year in accordance to the new plants put in operation. Comparing the January and November production data, there is nearly doubled electricity production per one month. This graph indicates the trend of agricultural biogas production and utilisation in the Czech Republic.

The major challenges in the Czech Republic ranges from abolishing basic administrative barriers, establishing of common operational standards, to the work on sustainable energy crops issues, digestate registration and trade, and soil protection. CzBA sees very important to synchronise all these topics with the European trends. This is the only way to the successful development of cross border projects and cooperation in the future.

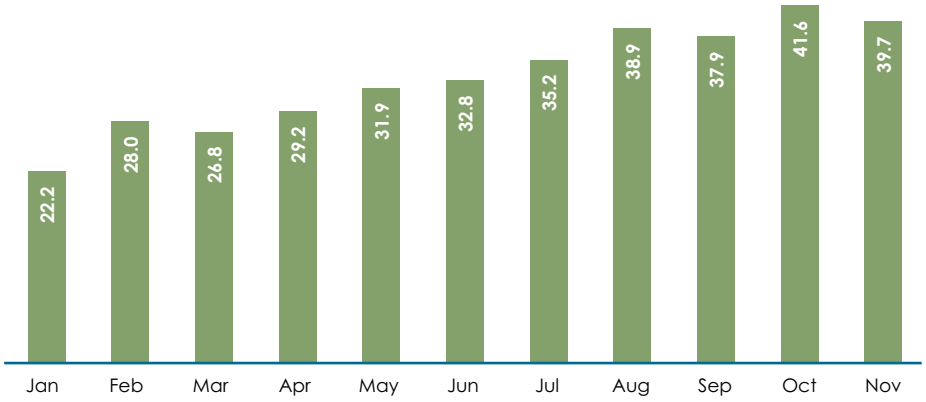
In the field of technology and policy CzBA focuses on development of biomethane as the only fully renewable and sustainable natural gas substitution for general use in gas grids as well as a highly efficient transportation fuel.

The total estimated agricultural biogas potential in the Czech Republic is 500 MW, or about 2 billions standard cubic metres of biogas per year (Graph 2).

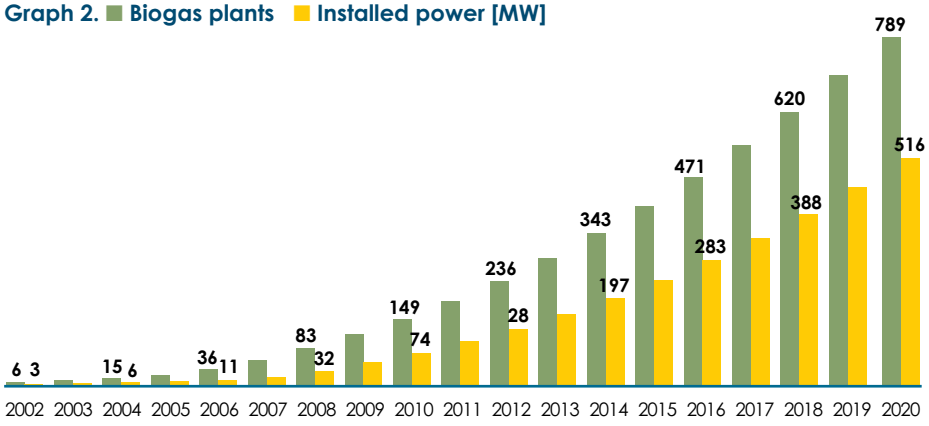
Table 2. Biogas production in the Czech Republic (January – November 2009)

Entry	Electricity produced [GWh]	Share
Renewable energy in total	4721	100%
Biogas in total	364	7.7%
Landfill gas	61	23.02
Total	**209**	**96.55**

Graph 1. El. production [GWh]



Graph 2. Biogas plants Installed power [MW]



Solar promise advancing – but how to finance

Philip Hunt

Solar energy installations for commercial power generation are generally divided into two types; solar power concentrators and photovoltaic cells (PVs). Industrial-scale generating plants have until recently been of the solar power concentrator type, but PV plants such as the 20 MW site in Beneixama, Spain, are becoming more common as photovoltaic technologies advance.

Industry observers generally believe that the future belongs to PVs, simply because the infrastructure requirements, apart from grid connections, are less. Solar photovoltaics are now generating electricity in more than 100 countries, and are the fastest growing power-generation technology in the world.

The 46 MW Moura photovoltaic power station in Portugal, completed in 2008, and the 40 MW Waldpolenz Solar Park in Germany (also completed in 2008) are characteristic of the trend toward larger photovoltaic power stations. Much larger ones are proposed, such as the 550 MW Topaz Solar Farm in California.

An EPIA (European Photovoltaic Industry Association) and Greenpeace Advanced Scenario shows that by the year 2030, PV systems could be generating just under 2,000 Gw of electricity around the world. In other words, enough solar power could be produced globally in twenty-five years' time to satisfy the electricity needs of almost 14% of the world's population.

CONVERSION EFFICIENCY – THE DRIVER

The key driver behind the rise of PV-generated power in the last few years is conversion efficiency, or the rate at which sunlight is converted into electrical energy. Photovoltaic conversion efficiencies in the past have lagged at less than 10%, but recent advances in the technology have driven conversion efficiencies to much higher levels. 10-12% is now the norm, with some manufacturers achieving 25-30% conversion and researchers pursuing even higher levels.

However the PV world was galvanised in July this year when the University of Texas and the University of Minnesota announced that that they had discovered a process able to increase the conversion efficiency of solar cells up to 66%. What was their secret?

In typical PV cells, much of the energy generated is lost through heat before it can be captured and turned into electricity. The University of Texas process slowed down the cooling process of hot electrons inside the cell, then captured and transferred that heat into energy. A solar site to demonstrate the practicability of the new process is now planned at Texas Southern university's Houston campus.

The results are important because many investors have been waiting for conversion efficiencies to pass the psychologically significant 50% ratio. With that barrier now overcome, other research programmes will be attempting to duplicate the results, and the result in the longer term will be wider availability of high-efficiency PV solar cells, with the resulting greater attraction both for public utilities and for technology investors.

BUT ALSO COST …

While conversion efficiency rates are still the front-runners in grabbing headlines, the other – and some would argue more important – driver is cost. Pure silicon PV cells are the most efficient, but pure silicon is expensive and, increasingly, becoming hard to obtain.

Cheaper alternatives for

PV technology include thin film, involving amorphous or micromorphous silicon, or ignoring silicon altogether in favour of other materials such as cadmium telluride. Alternative PV technologies are often smaller as well as cheaper. Unfortunately they are also much less efficient, with conversion rates typically around 10-12 %.

However the sheer fact that the panels can be made in more compact packages enables them to be produced relatively easily and cheaply, which compensates for lower efficiency. Research is also progressing in other areas such as organic solar cells or even nanosolar cells, which in theory could be embedded into paint to turn whole building surfaces into power generators.

INNOVATIVE FINANCING REQUIRED

A significant obstacle to wider implementation of large-scale solar plants has been that of capital cost. The US has dealt with this barrier for some years by means of the Power Purchase Agreement (PPA), which contracts electricity generators to power purchasers for a period of, say, five years.

Such PPAs have played a key role in the financing of independently owned electricity-generating plants, and are often regarded as central to the development of the whole industry there. In 2006, US investors began offering free solar-panel installation to some electricity generators in return for a 25 year contract to purchase electricity at a fixed price. By 2009, over 90% of commercial photovoltaics installed in the United States were installed using a power purchase agreement.

More recently however, doubts have been expressed about the real performance of PPA financing. As of August 2010, the California Public Utilities Commission (CPUC) reported that 789 Mw of such power projects had failed to come online on time (some projects are more than a year overdue), with another 574 Mw being completely terminated. Which has lead some solar investors to complain bitterly that the fast payback promised has not been the reality.

Perhaps it takes whole-industry-sector cooperation to ensure that financing is available to prevent progress stalling. Like for example the Solar Europe Industry Initiative (SEII) launched in June 2010 in Madrid. SEII is designed to help Europe meet the target for solar photovoltaic of supplying 12% of EU electricity demand by 2020, and involves the European solar photovoltaic industry co financing 1.23 million in European R&D (60% from the private sector) to that end.

However, as the EPIA itself points out, research is only one part of making a market. Increasing production capacity is as important in order to achieve economies of scale and build public support for the market. "R&D is not sufficient alone and has no impact on competitiveness if it is not accompanied by an increase in volumes and market development," says Virgilio Navarro, Vice President of EPIA and CEO of ATERSA. "The 40% price decrease in 2009 and 50% in the last two years confirm that political support is still needed to reach economies of scale by increasing production." ●

Can thin film solar modules be the right choice for a sustainable future?

In the solar photovoltaic energy industry (solar PV) new film based technologies were introduced to reduce the costs of collecting electricity from the abundantly free supply of solar energy. This has brought about new hope for the industry following the silicon shortage and the ensuing growth slowdown of the solar PV industry in 2004-2005.

What brought about these developments, when previously successful companies blame the failure on the industry's inability to withstand competition from the avalanche of really cheap crystalline silicon solar modules? Is there anything wrong with the technology we believed to be so successful?

Well, News does like sensation and failure and controversy have always attracted the headlines. But why is it there is no news of the thin film companies that have already achieved their targets which were roadmapped by those who could not keep up with the competition? Why is it that we have few headlines about those who have achieved positive results?

In fact there are some who can really do something about cost reduction. Some of them have achieved more than 50% reduction in the cost of ownership since 2008 and they are on track to achieve US$0.70/W by the end of 2010 with potential for further reduction. Also there are companies like GreenSolar Equipment Manufacturing Ltd, from Hungary, that have already achieved the cost of ownership of US$0.70/W by Q2, 2010.

GREENSOLAR EQUIPMENT MANUFACTURING LTD HAS JOINED THE 100 MWPS CLUB

GreenSolar Equipment Manufacturing Ltd was established in the very heart of Hungary. At its Budapest site GreenSolar has a well assembled team of R&d experts, engineers, technicians , experienced managers and a support team of 130 people who mostly come from its predecessor company Energosolar Ltd, a successful turnkey thin film supplier in the EU since 2004 which is delivering more than 100MW thin film production all around the world.

Ever since the acquisition of Energosolar's IP and knowhow GreenSolar continues to develop, manufacture and deliver turnkey production lines for low cost mass production of thin film solar modules. Currently GreenSolar offers vertically integrated PV solutions to its customers. These are based on the amorphous thin film technology from the thin film factory to the solar park installation. With GreenSolar's production line, modules are made in a process of "glass in – module out" which significantly reduces materials, labor and energy needs.

Production lines are available as follows:

- Manual production in line with an annual production capacity of 7MWp
- Semi-autonmated production line with a capacity of 15 MWp/year
- Fully automated production line with a minimum capacity of 30 MWp/year and increments of 15 MWp/year.

GreenSolar's team a great experience. They have achieved several projects in the 100 MWps range and delivered these to international players in Thailand, China, Hungary and Bulgaria.

REASONS TO GO THE AMORPHOUS-SI TANDEM WAY

- modules are cheaper to produce than crystalline ones,
- modules convert more electrical energy than crystalline modules with the same nominal power used under high temperature environment or in diffuse light conditions,
- thin film solar cells contain much less active material than the mono-/ polycrystalline solar cells and their technology only involves

low temperature processes their production is more cost effective,

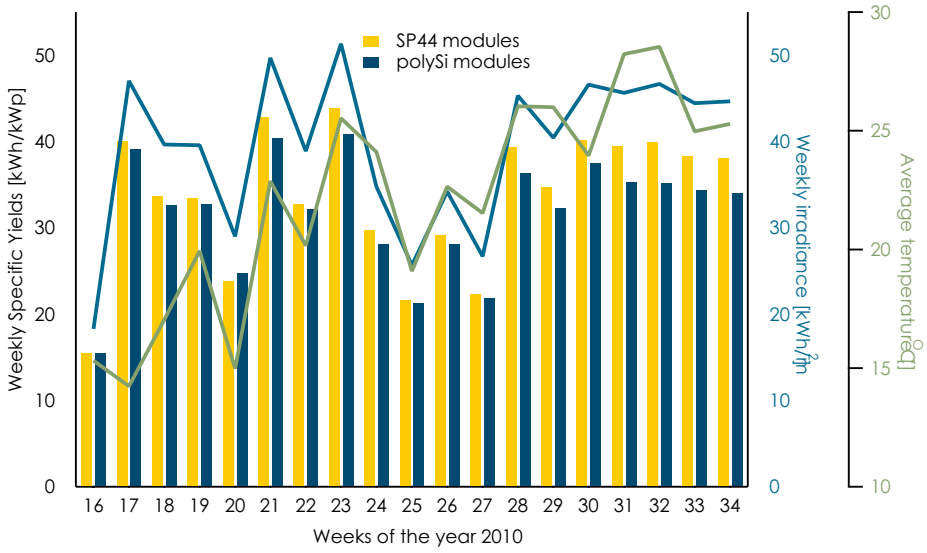
- A shortage of silicon raw material shortage does not affect the production process because thin-fil technology uses significantly less from this material,

By using GreenSolar's proprietary equipments clients are capable to produce "one-man" sized solar modules based on amorphous-silicon tandem technology. A key feature of this technology is the use of Plasma Enhanced Chemical Vapor Deposition (PECVD) to form the amorphous silicon semiconductor film layers. While other companies use PECVD in a piece-by-piece way, GreenSolar uses a sigle-chamber batch process to save on gasses and equipment needs (one chamber v.s. 6-8 chambers of piece-by-piece lines).

The standard average module efficiency of GreenSolar's thin film solar modules is 5.7% with peaks of 6.58%, while aperture efficiency is 6.38% peaking at 7.3% at a cost of ownership as low as 0.70 USD/W and a reachable LCOE level of 0.15 USD/kWh!

GreenSolar's amorphous silicon thin film solar cell technology involves the deposition of two extremely thin solar cell structures on top of each other onto a TCO-coated glass sheet with a total layer thickness of less than one micron. This structure is called tandem or double junction solar cell. In this solar cell structure the first cell converts the mainly shorter wavelength part of the spectrum of incident light while the second cell converts the longer wavelength part.

Figure 1: Comparison of weekly specific yields of the SP44 and the polycrystalline modules



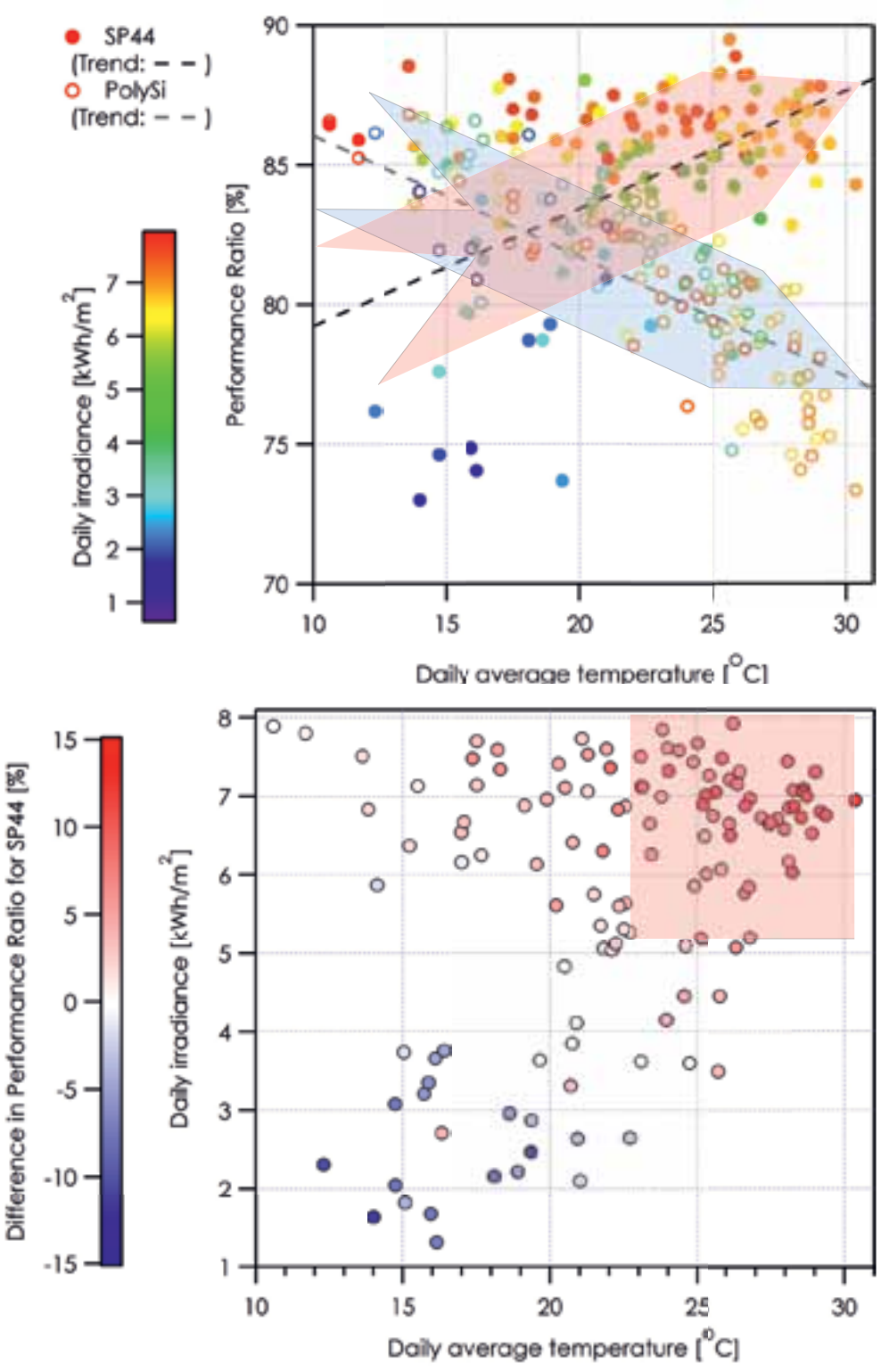
Comparing this structure to the so-called single junction structure, where only one solar cell structure is deposited on the TCO-coated glass sheet, it is possible to achieve the same absorption while the individual cells are thinner. The thinner the amorphous silicon layers are the less the degradation and the higher the stabilized efficiency of the solar cells.

Although the energy conversion efficiency of amorphous modules is lower than that of single-crystal units (an average of 6-7% compared to an average of 12-16), as amorphous silicon thin film solar cells have more favorable temperature dependence compared to their mono-/ polycrystalline counterparts, they work better in diffuse or low intensity light conditions and their yearly generated energy yield – under real life conditions – compared to their nominal power is higher as well.

PV FIELD TEST INSTALLATION IN BULGARIA

One of GreenSolar's reference customers is SolarPro AD, a Bulgarian factory producing amorphous silicon based PV modules from production lines supplied by GreenSolar. For real-life module performance testing standard products SP44 of SolarPro together with one of the well-known polycrystalline module from the market were installed on a test PV field and have been monitored for five months. The modules were mounted under a fix tilt angle optimal for annual average production. The total capacity was about 1.7 kWp for both types of modules connected to the same type of inverters

Figure 2: Daily performance ratios for the kinds of mondules (above) and the differnce of the values with respect to daily average temperatures and irradiance



under similar dc conditions.

During the entire test, environmental data, such as irradiation in the mounting plain, wind speed and ambient temperature were constantly measured and logged under a high time resolution. An average daily irradiance of 5.8 kWh/m² with peak days of 7.9 kWh/m² was obtained. Ambient temperature ranged from +1 to +40 degrees Celsius with an average of +22 degC. Output values Pac and the integrated daily energy production were obtained from the inverters.

The data which was collected on a daily basis showed that the total energy generated under the test conditions, incorporating all inverter losses corresponded to a one watt-peak installation for the given module type. Also, the module performance ratios, defined as the ratio between the generated energy and the energy expected from the standard test condition (STC) were calculated and compared.

Specific yields and performance ratios were compared on a weekly basis, and daily data was analyzed as the functions of irradiance and average ambient temperature. On average, about 6% higher specific yields were obtained from the dual-junction SolarPro SP44 modules than that of the polycrystalline ones [Figure 1]

Figure 2 shows the daily performance ratios of the SP44 modules compared to that of

the reference polycrystalline installation. For the amorphous modules an increasing tendency is seen with the increasing daily average temperature, while in the case of the polycrystalline modules this tendency is quite the opposite.

The bottom figure shows the absolute differences of the daily performance. Ratios are plotted as the function of the daily average temperature and irradiance. From the irradiance and temperature analysis it is seen that SP44 modules may perform some 10-15% better under high irradiance (> 5 kWh/m^2*day) and high average temperature (> 23 deg C) conditions than the poly crystalline ones.

Generally thin film cells tend to perform better under harsh working conditions, such as long hours of extremely strong sunshine, as well as extreme and diffuse (e.g. sunrise, sunset and cloudy weather) light conditions.

INDUSTRY FUTURE AVAILABLE PRESENT DAYS

GreenSolar is dedicated to continuous R&D activity, to assure its customers up-to-date solutions for keeping the manufacturing costs at the lowest levels, while improving the efficiency of the production. GreenSolar's strategic goal is to set LCOE on 0.1 USD/KWh For quite some time now, Greensolar's R&D team has worked on microcrystalline thin film development, and a target of 9 % is to be reached by the new product. Micromorph technology will be available in 2011, and micromorph of 1400 × 1100 mm size in 2012.

The turn-key solar module manufacturing equipment includes but is not limited to, the support and designing of the plant lay-out, procuring specific OEM equipments, producing the equipments, installation and ramp up, technology transfer, production training program, solar park training program and after sales support. GreenSolar targets to offer its customers the most competitive solutions through technology based on raw material available in abundance, low cost production and low ownership cost. Modularity of the production lines allow for a fast start and smooth expansion while production is running. Upgrade of the technology is achieved in the fastest delivery time on the market.

Today many of the solar cell technologies result in emission of harmful greenhouse gases, which are much more dangerous than carbon dioxide. Sulphur Hexafluoride is the most potent greenhouse gas with a global warming potential of about 23,000 times higher than that of CO_2 when compared over a 100 year period. Nitrogen Trifluoride (NF3) is a greenhouse gas with a global warming potential 17,000 times greater than that of CO_2 when compared over a 100 year period.

When deliveries and installations of orders are completed, GreenSolar pays special attention to R&D activities not just to achieve the lowest cost of ownership for its customers but also to pay special attention to contribute to a green, sustainable planet Earth by using only FLUORINE-LESS thin film technologies. In fact, GreenSolar's technologies do not require any kind of fluorine gases, neither SF6, NF3, nor F2. Thus, using GreenSolar manufacturing equipment means saving the atmosphere.

Amorphous Silicon in to be the viable solution for grid parity soon

Among many solar eqipment manufacturers, GreenSolar's main goal is to make solar energy economically viable also. Apart from GreenSolar's current products and services, the company expects to further improve its products which will result in an expected cost of ownership of just €0.50/W. These improvements will put customers using GreenSolar equipments in a position to offer panels at a price that will enable solar energy to be sold at prices comparable with retail electricity rates in regions with an average daily irradiance of 5 kWh/m^2 with peak days by 2012.

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Climate change and PV – new look at an old solution?

Michael Edmund

Climate change is already stimulating the development of a range of new technologies and new energy-saving applications. Photovoltaic (PV) technology, one area that has received growing interest in recent years as energy-conversion rates for PV panels improve, could bring about a whole new approach to the construction of building roofs.

According to the European Photovoltaic Industry Association (EPIA), all the buildings in Europe together account for a total ground floor area of over 22,000 square kilometres. And these buildings (or, more accurately, the roofs and walls that comprise them) could be used to generate as much as 1,400 TWh of PV electricity, or sufficient to satisfy as much as 40% of Europe's entire electricity requirement by 2020.

Increasing the use of existing roof and façade space for PV electricity generation has little or no environmental impact in terms of loss of green space; the buildings involved have already been constructed. What makes the concept more attractive is the integration of PV into new buildings, particularly in light of the recently approved Energy Performance of Building directive (EPBD), which requires significant improvement in the energy performance of new buildings.

The potential of adding PV to new buildings was examined further at the "Solar Decathlon" - an event on building-integrated photovoltaic (BIPV) systems at the Ministry of Housing in Madrid.

The meeting attracted interest from all parts of the construction industry, including architects and installers, as well as delegates from the renewable energy industry.

The meeting heard how integrating PV into the construction of a building offers significant development potential for the construction sector as a whole, not just for the PV sector. Apart from the generation of electricity, delegates learned how PV technology could improve the passive energy behaviour of buildings as well as replacing conventional building components, and provide weather protection and heat insulation.

Although many member states support the generation of PV electricity through the mechanism of Feed-In Tariffs (FiT), the concept of building-integrated PV is as yet not widely accepted. In countries such as France and Italy, where FiT reflect the greater costs of BIPV over simple adaptation of existing structures, BIPV represents over one third of the annual market. However, in Germany and Spain, where FiT do not reflect the greater costs of BIPV, it represents a very marginal share of the market (currently less than 1%).

A further consideration is the effect constructing new BIPV buildings has in stimulating the local, and even national, economy. Commenting at the BIPV event, Virgilio Navarro, EPIA's vice-president and CEO of ATERSA suggests that, "Spain has a unique opportunity to develop the BIPV market, which in addition to leveraging the decentralised nature of PV generation - energy generated by the citizen for the citizen - would enable the stimulation of tens of thousands of jobs firmly anchored in the local economy, many of which are in the construction industry".

Building roofs could perhaps be reclassified as an underused resource, stimulating a whole new way of thinking about weather protection and exploitation!

PVs in BLOOM

From marginal areas to pv platforms: The PVs in BLOOM project. The PVs in BLOOM Project has already triggered the authorization of 5,5 MWp of Photovoltaic power over marginal areas in Europe, and another 15 MWp are foreseen before the end of the project (September 2011).

Saarbruecken Airport – Germany: PVPP over airport buffer zone

The PVs in BLOOM Project - "Farming photovoltaic flowers: a new challenge for land valorisation within a strategic eco-sustainable approach to local development", funded within the Intelligent Energy Europe Programme, aims at supporting the installation by public and private investors of ground photovoltaic plants of small and medium dimensions (Photovoltaic Panel Plantations – PVPPs) with a power ranging from 50 kWp to 2-3 MWp in areas characterized by intrinsic, induced or latent marginality (terrains that are no longer able to answer positively to investments or that have exhausted their primary and exclusive function).

WHY TO "GO MARGINAL"

The project builds on significant considerations that have a direct impact on EU citizen's everyday life:

- The irrational use of land resources for industrial, commercial and in some cases agricultural activities has lead in many countries to the abandonment of vast terrains in degraded conditions;
- Land degradation is often the result of human activities leading to the impoverishment of the soil, the dispersion of pollutants, and the impossibility to use the terrain for other purposes. Landfills, quarries, former military sites/supply-storages, areas around major infrastructures such as airports, electrical substations, power plants are examples;
- Starting new activities using marginal terrains avoiding the sacrifice of terrains subtracted to agriculture or to the landscape is not only ethical, but also economically convenient with respect to leaving them abandoned;
- The transformation of greenfields into brownfields, more noticeable in areas of high urbanization/ industrialization continues inexorably and must be contained: little attention now will lead to big problems in the future.

The PVs in BLOOM Project tackles the big game of transforming these environmental wounds (existing marginal terrains) into an opportunity for new paths of development and responsible growth. Examples can be found in Europe (e.g. Germany, Italy, Austria), in USA and Japan.

FUTURE SCENERIES: SOUTH EAST EUROPE

The experience gained through the "PVs in BLOOM" project and other EU studies allow to estimate that massive amounts of terrains will be reduced to marginality in the near future, while relevant existing resources such as areas of intrinsic marginality remain unexploited.

New sceneries, such as South East Europe, are particularly interesting sceneries for responsible RES development given the many marginal soils that are heritage of military

Solar Integrated T2 SolarRoof Membrane on a re-naturing landfill in Malagrotta, Italy

and other linked activity. Their recovery through RES investments can also trigger an economic leverage effect and be an efficient and safe way to direct the use of structural funds and other EU tools towards truly environment-friendly investments.

LANDFILL CAPPING WITH THIN-FILM

The final capping of an expired landfill and the insertion of the site in the surrounding environment is one of the most delicate aspects of waste management for local public administrations. The final capping of landfills is, generally, realized through a re-vegetation of the final coverage (Directive 99/31/CE), which proves to be highly expensive.

Best Practices realizations in Texas (USA), Malagrotta (Rome) and Leppe (Germany), prove that other solutions are possible: geo-membrane textile covers integrated with thin film PV panels allow the local public administrations to abate the cost of capping while becoming a renewable energy producer giving functionality to an area which is destined to stay unused for a long period of time. Further developments are foreseen also through pilot cases in Italy through the PVs in BLOOM Project.

THE PROMOTERS

The Project is managed by an international consortium, led by Unioncamere del Veneto (the Regional Union of Chambers of Commerce of Veneto, Italy) and composed by 8 partners from 6 EU countries: the Energy Agency of Sassari Province (Italy), , the Development Company of Municipality of Milies (Greece), the University of Jaén (Spain), the Chamber of Commerce, Industry and Shipping of Valencia (Spain), the Institute of Physics of the Lublin University of Technology (Poland), Innovation Region Styria (Austria), and the Italian-Slovak Chamber of Commerce (Slovakia). ●

pvs in bloom

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Wind energy technologies – mature or still evolving?

Philip Hunt

Onshore wind energy, many believe, is a near-mature technology. And around the world, countries are installing vast numbers of the familiar 'propeller-blade' wind turbines. Yet wind-energy technologies are evolving in a variety of directions, and innovative approaches are producing some surprises.

Within the EU, more than two thirds of total wind-powered generating capacity is currently installed in three countries: Germany, Spain and Denmark. Denmark already meets more than 20% of its electricity demand by wind energy, and Spain more than 10%.

And while wind turbines are springing up everywhere you look in Europe, the rate of installation is dwarfed by progress elsewhere, especially in Asia, believes Christian Kjaer, CEO of the European Wind Energy Association (EWEA). "The European Union is a world leader in wind energy but faces serious competition from China, the United States, Japan, South Korea and India. I would hate to see Europe losing out," he says (www.ewea.org/).

His view is confirmed by the World Wind Energy Association (WWEA), which points to Asia as accounting for the largest share of new installations in 2009 (40.4 %), followed by North America (28.4 %) and Europe (27.3 %). China continued its role as the locomotive of the international wind industry, adding 13,800 MW within one year – more than doubling the number of installations for the fourth year in a row.

WIND-TURBINE TECHNOLOGIES EVOLVING

Yet the technologies employed to generate wind energy are evolving. For the conventional wind turbine, since the first implementations for commercial power generation in late 1970s, capacity has evolved from 0.022 MW to about 6 MW today. By 2030, average turbine sizes of 2 MW (onshore) and 10 MW (offshore) are expected, with gigawatt-size wind farms likely for offshore.

And there are new approaches to tower construction appearing. A small German technology startup (TimberTower GmbH) has pioneered the use of wood for constructing the turbine towers, instead of the more familiar steel. The company claims its unique method of construction and ease of erection saves on transport costs and helps reduce CO2 emissions from manufacturing.

Timber Tower erected its first prototypes in early 2010, and following TÜV certification is building a tower with a 100m height from ground to hub. The tower will be capable of supporting a turbine unit of 100 tons.

Another European company, the Swedish Vertical Wind AB, has developed an innovative approach to wind-turbines – using a vertical rather than a horizontal axis. Vertical Wind turbines place the generator at ground level, and benefit from having no gearbox, fewer moving parts and a reduced requirement for structural strength. The turbine blades themselves revolve at a higher level about the central (vertical) axis using a relatively simple yet effective blade design.

Vertical Wind's first 200 kW commercial wind turbine went online in Falkenberg, Sweden, on 14th April 2010 and began delivering energy to the power grid. It will soon be joined by three more turbines of the same design. The project has been sponsored by E.ON and Falkenberg Energy, and supported by the Swedish Energy Authority.

MORE ESOTERIC INNOVATIONS

More esoteric wind-energy innovations can be seen in smaller-scale installations, for example in public monuments and artworks. The Widnes Waterfront Future Flower, alongside the river Mersey in Widnes, UK, is a gigantic metal flower designed by London architects Tonkin Liu.

The installation, part of a regeneration project in the area, is 14 metres high with

perforated petals of steel. Small wind turbines within the structure power a storage reserve and a network of LED lights, which illuminate the entire structure at night.

Other, more speculative research has postulated the development of large tree-like structures, in which the fluttering of each 'leaf' in the wind generates a small amount of electricity from the twisting action of the leaf on its 'stem'. With thousands of tiny leaves on a generating 'tree', the total energy generated could turn the approach into a commercial proposition.

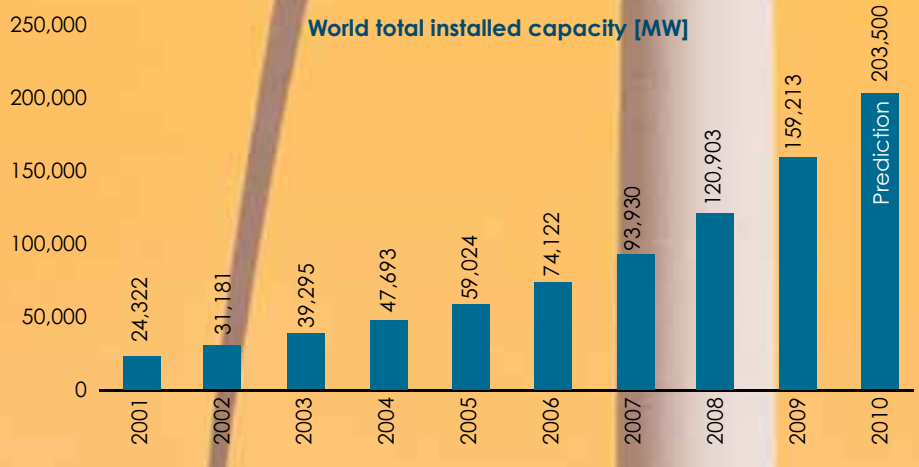
Onshore wind-energy is not the only sector evolving. A novel offshore wind farm was announced at the Yokohama Renewable Energy International Exhibition in 2010. The 'Wind Lens' offshore farm looks like a series of floating interlocking 'hoops', with large wind turbines mounted on the edges. The turbines focus the wind into the centre of each hoop, thus apparently increasing the amount of energy generated.

STILL PLACE FOR THE COOPERATIVE MODEL

But it may be that the most significant innovations influencing wind power in the longer term will come not from technology, but from social attitudes. Denmark developed a lead in the European wind-energy sector for a reason – it was the first to put in place a clear benefit for families or communities willing and able to generate their own electricity.

Danish citizens in the 1990s could purchase a turbine outright, or shares in wind-turbine cooperatives. By 1996, the country had around 2,100 such cooperatives, and their role was not limited to single turbines. The Middelgrunden offshore wind farm with 20 turbines, the world's largest offshore farm at the time it was built in 2000, was 50% owned by 10,000 investors and 50% by the municipal utility company.

By 2001 over 100,000 Danish families belonged to wind-turbine cooperatives, which had installed 86% of all the wind turbines in Denmark. Using this system around 5,500 turbines had been installed by 2004. The cooperative model has since spread to Germany and the Netherlands. ●



Sustainable pioneering

Pioneering the sustainable energy planning at the local level in European cities and towns – an example from Bulgaria

By Holger Robrecht and Daniel Morchain

From the Mediterranean Sea to the English Channel to the Black Sea, nine cities and regions and six expert organizations have come together to develop and implement local sustainable energy action plans. Burgas, in the Southeastern region of Bulgaria, is one of the cities which set this challenge upon itself.

"The tools and strategies developed as part of the Sustainable NOW project have enabled Burgas to make a confident transition onto becoming a sustainable energy city."

Atanaska Nikolova, Deputy Mayor, Municipality of Burgas

As the partners of this EU co-financed Sustainable NOW project understand it, making the transition to a sustainable energy city requires more than a few isolated actions that can be labeled as 'green energy'. A few new PV panels and wind turbines in the city landscape won't do! A successful transition requires addressing the climate change challenges that we are facing and developing a sustainable community offering high quality of life and using the opportunities arising from a green economy.

The Municipality of Burgas has initiated this transformation with an analysis of its internal processes and a conscious consideration on how they can be improved to generate long-lasting, sustainable changes. A holistic analysis of the city's baseline situation supported by an integrated management approach centered on sustainability issues as leitmotifs, are the foundations on which the energy strategy is being built.

A public lighting post powered by wind and solar sources in Burgas city

But, what does this mean in the day-to-day operations of the Burgas local government? Firstly, it means that Burgas needs a clear picture of where it stands in terms of energy production at the local level, energy consumption, and GHG emission. Measuring the city's emissions can be done through several tools, including those developed by project partners ICLEI – Local Governments for Sustainability and Climate Alliance. In addition, collection of data at the local level demands having stakeholders on board, including energy companies and other industries willing to share their data.

To this end, Burgas is the first municipality in Bulgaria to establish an 'Advisory Council for Local Sustainable Energy Planning'. It meets regularly, bringing together different actors (including citizens) to find solutions to challenges in the field of energy efficiency and the use of renewable energies. Thus, several local players contribute ideas to the development of an inclusive strategy.

At this point, expert cities within the Sustainable NOW partnership are teamed up

with learning cities to share experiences and fast-track the tailored adoption of proven efficient methods – for example: how to set tangible, demanding and achievable targets within the local action plan. To this end, Burgas has counted with support from the city of Munich.

The project is developing a set of tools to support local governments across Europe in decision-making for integrated energy management, climate protection actions and securing local energy supply. For instance, the local energy action plan wizard (LEAP Wizard) is a software tool which collects data on sustainable energy practices from governments across Europe. It allows local governments to identify replicable actions in a fashion that can support local decision-makers with clear, structured information. In other words, it shows local governments the actual results of actions implemented elsewhere, listing what resources, benefits and challenges it has brought about there, and how they can also be successful...in Burgas.

Another product of the Sustainable NOW project will be an analysis of financial aspects of sustainable energy projects. Its aim will be to make information available to local governments and in this way assist them in decision-making. The guide will support local governments, for instance: to identify and use mechanisms that exist in Europe to fund energy projects at the local level, to evaluate different potential investments, and to consider appropriate criteria when implementing these actions.

European cities, towns and regions are increasingly joining the sustainable energy action movement. This is partly thanks to the 'Covenant of Mayors' European initiative and the EU 2020 Strategy. The Sustainable NOW project, in this context, guides the creation and implementation of local, sustainable energy action plans in Burgas and beyond.

For further information contact the Sustainable NOW project coordinator, ICLEI – Local Governments for Sustainability, at sustainable-now@iclei.org

The Sustainable NOW project is co-funded by the Intelligent Energy-Europe programme.

www.sustainable-now.eu

SustainableNOW

Smart grids – making electricity work harder, and smarter

Michael Edmund

Traditional electricity distribution involves high voltage connections between large central power stations and local sub-stations, which in turn supply businesses and homes through medium- and low- voltage local systems. This one-way transmission of power has served industry and domestic consumers well for years.

However the system possesses inherent drawbacks. It cannot easily accommodate widely distributed sources of power, while at the national level, there is an increasing requirement for energy resilience when supply is threatened. Furthermore, the traditional system offers no opportunity for power generator and consumer to communicate with each other. As the production and consumption of energy become increasingly prominent in the fight against climate change, there is an increasing need for modernization or even outright overhaul of the electrical distribution system, and the development of so-called "smart grids" is seen as one potential answer.

Smart grids incorporate detection, measurement and control systems capable of monitoring the supply at various points across the power

grid. They allow the electricity producing, distributing and consuming components of the system to engage in two-way communication with each other and with a variety of automated devices.

Future smart grids could turn on selected home appliances or factory processes during periods when demand is lowest, and power least expensive. A further development might even see the advent of real-time electricity pricing.

HOW IS THE EU SUPPORTING THE NEW TECHNOLOGIES?

In fact, the EU has supported Smart Energy networks for more than a decade through previous Framework research programmes, and they constitute one of the priorities of the current Seventh Framework Programme for research (FP7, 2007-2013). Projects receiving support include "active distribution networks" with full integration of demand and distributed energy resources (ADDRESS), a pan-European grid advanced simulation and state estimation (PEGASE) and open public extended network metering (OPEN METER).

The ADDRESS project for example, with 25 partners from 11 European countries, benefits from €9 million EU funding. The project is focusing on giving domestic and small commercial consumers a proactive role in controlling their energy consumption, which is felt to be one of the biggest challenges in the networks of the future.

OPEN METER addresses the development of advanced metering, of which the Smart Meter is a key component. Smart Meters may be installed in businesses and homes that are generating wind or solar electricity to measure the production of any surplus, and provide the means to sell it back to the utilities.

Future power grids will need to transport not only electricity but also data in either direction; information that will support automatic meter reading, remote connection and disconnection, flexible tariff management and demand management. OPEN METER addresses the main barriers to greater adoption of Smart Meters, and aims to provide proposals for a set of public standards that will facilitate their introduction. The project is run by a consortium of 19 partners with the aid of €2.4 million in EU funding under FP7.

Meanwhile, national grids are becoming more interdependent as power imports and exports are increasing, and the PEGASE project is investigating new means to monitor and control the pan-European grid, with the objective of ensuring a secure and reliable transmission network. The EU is providing €9 million in finance towards this project.

News

More oil from the North Sea – while storing carbon

New research by Durham University (UK) shows that Britain's North Sea oil fields could yield an additional three billion barrels of oil over the next 20 years, by pumping liquefied CO2 into them. This novel technology has the ability to satisfy two demands at a stroke. It is a potential means of meeting carbon capture (CCS) demands by using depleted oilfields to store CO2, while enabling enhanced oil recovery from these same oilfields. Experience from the USA shows that an extra four to twelve per cent of the oil in place can be extracted using CO2; oil fields in Texas, USA, have been successfully exploited using this technique since the 1970s.

More information: http://www.dur.ac.uk/news/newsitem/?itemno=10879

Google launches huge offshore wind-power backbone

Google has announced an ambitious $5 billion programme to build an offshore wind-farm backbone along the Eastern seaboard of the US. Likely to extend some 350 miles along the coast between New York City and Norfolk, Virginia, the infrastructure will be placed in shallow trenches on the seabed 15 to 20 miles offshore. The backbone will act as the foundation for dozens of future wind farms along its route, and could eventually deliver up to 6,000 Mw of clean power to the onshore grid.

Source: New York Times, 12th October 2010.

New 'Innovation Union' to turn ideas into jobs

The European Commission announced on 6th October 2010 the creation of a new "Innovation Union", a strategic approach to EU innovation driven at the highest political level. The new initiative will focus Europe's efforts on challenges like climate change, energy and food security, health and an ageing population. It will use public sector intervention to stimulate the private sector and remove bottlenecks which stop new ideas on climate change, energy and food security from reaching the market.

Máire Geoghegan-Quinn, Commissioner for Research, Innovation and Science and Vice-President Antonio Tajani, responsible for industry and entrepreneurship said that, "As we emerge from crisis in the teeth of fierce global competition, we face an innovation emergency. If we do not transform Europe into an Innovation Union, our economies will wither on the vine while ideas and talent go to waste. Innovation is the key to building sustainable growth and fairer and greener societies. A sea change in Europe's innovation performance is the only way to create lasting and well-paid jobs that withstand the pressures of globalisation."

Some key elements:

- "European Innovation Partnerships"will mobilise stakeholders – European, national and regional, public and private - behind well-defined goals which combine tackling social challenges with the potential for European leadership. The partnerships will step up R&D, coordinate investment, speed up standards and mobilise demand.

- In 2011 a major research programme on public sector and social innovation will pilot a "European Public Sector Innovation Scoreboard". It will launch a European Social Innovation Pilot to provide expertise for social innovators and propose social innovation as a focus of European Social Fund programmes.

- National governments will be encouraged to set aside dedicated budgets for public procurement of innovative products and services. This should create a procurement market worth at least €10 billion a year for innovations that improve public services.

More information, see: http://ec.europa.eu/innovation-union

EP strikes deal to free up 146 million euro for renewable energy projects

Council and Parliament have reached an agreement yesterday afternoon to free up 146 million euro of uncommitted funds under the European Energy Recovery Programme to create an instrument to finance energy efficiency and renewable energy initiatives.

ALDE shadow rapporteur Lena EK, (Sweden, Centre Party) said:

"Parliament has fought hard to make a maximum amount of money available for investments in energy-efficient projects. In times of financial constraints Europe should work together to make our way of life cheaper and more sustainable. By launching energy-efficient projects we will create jobs, green up the economy, and become less dependent on oil-producing countries."

The agreement that was reached with the Belgian Presidency follows the adoption of a report amending the European economic recovery plan (EERP) in the Industry Research and Energy (ITRE) committee on 2 September, allowing for unspent money to be used for innovative renewables and energy efficiency projects.

Lena EK also made a number of proposals on cutting red tape and make the whole procedure faster and more transparent. "I am very pleased that the agreement also says that special focus should be put on over head costs in the report as well as auditing. We have to make sure that tax money is spent wisely."

Projects that will receive funding include those for public and private buildings incorporating renewable and/or energy efficiency solutions.

Other eligible projects include decentralised local renewable energy sources and their integration in electrical grids; clean urban transport, local infrastructure, including efficient street lighting, electricity storage solutions, smart metering and smart grids that make full use of Information and Communication Technologies.

The fund will be managed by public financial intermediaries in order to maximise short-term impact.

Parliament's ITRE committee will formally adopt the agreement on 26 October and the Parliament as a whole will vote on the rule changes in November.

More information: http://www.dur.ac.uk/news/newsitem/?itemno=10879

Best colour for wind turbines could be purple

Recent research into wildlife mortality at wind turbine towers has unearthed the fact that the colours white or grey, the colours most used for wind turbines, could be the worst colour of all for the safety of birds and bats. White and grey are the predominant colours for wind-turbine blades, because they blend most easily with the sea and sky.

Yet they are also colours that reflect the highest levels of UV light, states the paper from Loughborough University, UK. These high UV levels attract greater numbers of flying insects, which attract birds and bats in turn.

The researchers measured the attraction to insects of a range of paint colours, including white, grey, blue, red and purple, also examining the UV-reflecting abilities of the paints used. The least attractive paint colour for insects was purple!

Source: European Journal of Wildlife Research, 20 September 2010.

Beywatch – your neighbourhood energy watch

European researchers are creating an electricity load sharing and balancing system that functions at neighbourhood level rather than nationally, treating local communities as miniature power grids that can share the energy generated at each house according to need.

The European project Beywatch ('Building Energy Watcher') is creating 'smart' homes that not only generate electricity and hot water at each household, but also balance energy needs within the neighbourhood. The project team is developing a system of combining ultra-high efficiency home appliances with smart homes, and neighbourhood information networks for monitoring and control, as well as real-time links with the energy utility.

The system includes in-home power and hot water generation using combined photovoltaic and thermal solar panels. However the key element of the project is the load-balancing for the grid at the neighbourhood level. A hardware and software agent called the Supervisor Entity links all the houses in a particular neighbourhood to the energy utility, and works with the in-home agents to increase or limit power to local homes as necessary.

Project coordinator Pierre Plaza explains, "Too much energy would be lost transferring it back to the utility and then on to another destination. Instead, the supervising agent can direct the energy to another house in the neighbourhood that needs it."

Source: ICT Results.

Putting hydrogen fuel in the driving seat

The European project Hylights undertook to boost the uptake of hydrogen and fuel cells in European transport. Large-scale demonstration activities took place to raise public awareness of hydrogen as a fuel for vehicles and prove the effectiveness of the technology.

Showcasing the technology provided valuable lessons for participants by focusing on the infrastructure required for hydrogen-powered vehicles and their refuelling needs. The project constructed an assessment framework and carried out a gap analysis to compare best practice results with stakeholder expectations.

An accurate assessment enabled large scale demonstration activities to be successfully organised, providing a solid basis for major financial investment. Researchers also conducted a questionnaire with local authorities to gain valuable feedback on the results of demonstration activities carried out in Europe and the US. Respondents listed energy security, climate change and environmental protection among their main reasons for participating in the projects. Expected environmental and societal benefits included reduced emissions from public transport and decreased dependence on fossil fuels. Important technical issues were also raised, including the capacity of the refuelling infrastructure and the driving limit of vehicles.

Project partners recommended that more vehicles should participate in future demonstration activities and information exchange should be improved. Representatives from local authorities requested a clear framework for safety regulations and standards, subsidies for hydrogen production and liquefaction, and greater financial support in general. The Hylights project will help maintain Europe's commitment to sustainability by promoting hydrogen fuel technology and helping it gain wider acceptance.

Source: EU Research Information Centre

Something to say?

If you feel your news story should be seen in the pages of European Energy Innovation magazine. Please email the editor:

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