SUMMER 2011

european energyinnovation

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Biofuels - flying high?

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Looks at competitiveness vs. energy efficiency

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Foreword

As the world emerges from the financial crisis of 2008/9 - somewhat hesitantly, if the present excitement in equities is any guide - there has been a surge in global energy consumption. Not surprisingly, global greenhouse emissions have also increased sharply, and the corresponding figures for Europe show the same trends. Moreover, emissions due to transport now comprise almost one fifth of the European total, so it will be no surprise that energy and transport both figure strongly in the current issue.

As usual, we feature a number of distinguished contributors from academic institutions, from Parliament and from the Commission itself. Among these, a well-balanced article, by Polish MEP Konrad Syzmanski, warns about potential failure to meet energy efficiency targets, while arguing that energy should be a key driver for economic growth. Meanwhile, Professor Jan Kiciński of the Polish Academy of Sciences charts the planned transformation of that country's power generation, propelled by the twin stimuli of the need to modernize ageing and inefficient infrastructure, and by EU emissions policy. With increases in air travel widely perceived to be a significant factor in the growth of transport emissions, the 2010 Johannes Linneborn laureate Dr. Kyriakos Maniatis from the European Commission highlights the potential significance of using biofuels in aircraft.

Elsewhere in this issue, one editorial article casts a wry look at the significance of transport emissions, and the difficulties in defining "Green" Transport, while another highlights two exciting developments in the field of electric cars. Now the Deccan Herald hails from Bangalore, capital of the Indian state of Karnataka. Though no doubt an excellent newspaper, it would perhaps not be the first place to which readers of this magazine would necessarily turn for information. However, the Herald's July 28 story Europe turns hostile to car ownership is hard to ignore. It explores the techniques being adopted by a wide range of European cities to persuade car drivers to use other forms of transport, contrasting this with the more car-centred US approach. We note that the far-reaching consequences of climate change appear to have far-flung audiences; but that not everyone listens equally.

The recent German decision to phase out its nuclear energy might merit an article all on its own. However, there are predictable consequences for the renewable energy sector, and a thoughtful article from Michel de Vivo of ICOLD-CIGB explains the use of water to store electricity in order to even out peaks and troughs in power supply. This technique has potentially important applications, he argues, given that the unpredictable nature of wind-generated power was implicated in the widespread blackout in December 2006 – whose epicentre (the seismic reference does not seem inappropriate) was in Germany. And Germany is of course a world leader in the photovoltaic sector; Professor Maurizio De Lucia and his team from Italy offer a snapshot of the sector in Europe before examining some of the possible developments of photovoltaic technology. Among these, he argues, perhaps the most promising is a novel high-temperature application capable of delivering both hot water and electricity simultaneously. Elsewhere, Professor Nicola Pearsall from England provides an update of the research agenda of the European Photovoltaic Technology Platform, to be published at the forthcoming Photovoltaic Solar Energy Conference in Hamburg.

And there is a great deal more for you to consider inside…

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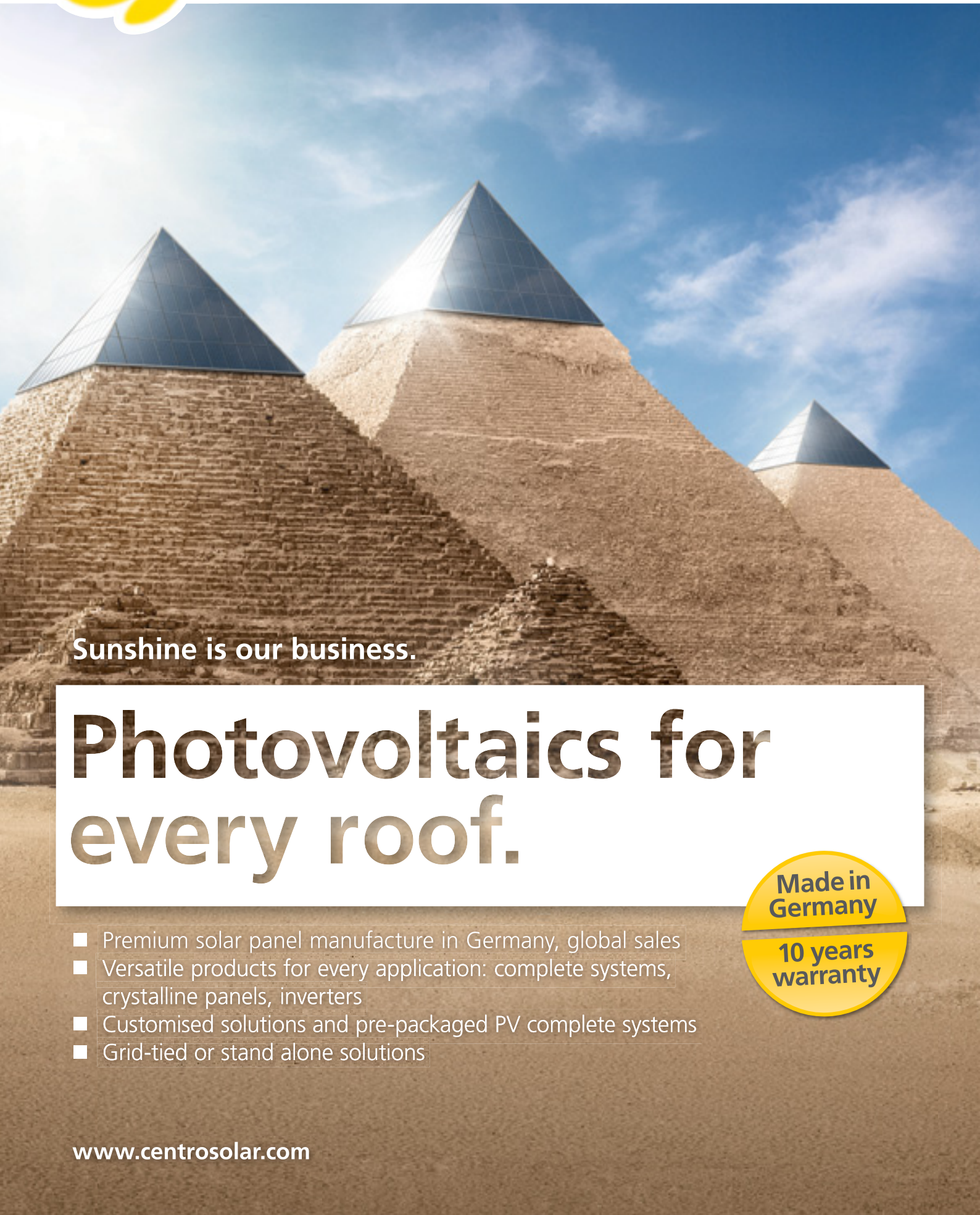

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Bank Chambers
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Tel:+44 20 8786 3695
Sales office +44 1372 726135
www.europeanenergyinnovation.eu

Sophia Silvert
Head of Brussels' EU Office
Telephone: + 32 2 347 70 19
sophia@europeanenergyinnovation.eu

Brussels representative office
145/15 Avenue Molière
B-1190 – Brussels
Belgium
Tel: + 32 2 347 70 19

To obtain additional copies please email info@europeanenergyinnovation.eu

PUBLISHER
Graham Pendred

COMMISSIONING EDITOR
Michael Edmund

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Competitiveness vs. energy efficiency: How to use our potential best?

by Konrad Szymański MEP

Poland enjoys one of the largest potentials for improvement in the energy efficiency field in Europe. The energy efficiency of the Polish economy is still about 3 times lower than in most of the developed European countries and about 2 times lower than the average in the EU. Obviously this indicates a continuous potential for energy savings, which is characteristic of a growing economy. There has already been significant progress achieved in the field of energy efficiency in Poland. During the last 10 years the energy intensity of gross domestic product fell for over one third.

Konrad Szymanski, Poland, ECR
Member of European Parliament

This success however was reached thanks to the technological development in industry sectors in the 90's. The transformation of the Polish economy was mainly a result of market changes and was driven by the market. The current incentives for 'transformation' are coming from the market regulators - are projected by the administration, government or EU regulations.

That is why in the present situation, as legislators, we need to be particularly careful, because in the case that our decisions are not properly verified in advance, we risk achieving the opposite results or else economic side - effects, such as: spread of energy poverty, loss of the competitiveness of European - based companies or even emigration of our businesses outside the EU borders (the so called carbon leakage effect). The extreme consequence

could be pictured as deindustrialization of Europe.

Already today European energy prices are extremely high. According to the statistics they are 23% higher than in the USA and 200% higher than in China. It surely does not attract investment to the Old Continent.

Furthermore, it is clear that the measures foreseen in the EU's growth strategy for the decade: Europe 2020, namely the increase of energy efficiency by 20%, will fail. This target will not be reached even by half.

This, however, is not the end of the battle. The European Commission has recently published

a proposal for an energy efficiency directive, to be negotiated by the Council and the Parliament after the summer break, to remedy the existing situation. According to the Commission's proposal the member states will have to put an obligation on energy retailers and distributors to achieve annual energy savings equal to 1,5% of their energy sales. The savings will touch everybody then, including households as end-users. The Commission has left some space open to the governments regarding the type of measures that they may adopt to achieve these savings. For example: creating a special funding program or taking a voluntary agreement is allowed. Although the negotiations have not yet started there is a wave of criticism over the text.

The lack of a legally binding obligation remains a bone of contention.

The risk of deflation of carbon prices as a consequence of the implementation of this directive causes unrest in DG Climate Action as of course it is difficult to make climate and energy policies coherent.

It may be questioned whether "energy efficiency is the most cost-effective and fastest way to increase security of supply and is an effective way to reduce the greenhouse gas emissions", as the European Commission stated in its directive proposal.

The link between the energy efficiency and security of energy supply must be investigated deeper. If a way to reduce the dependence from external energy sources is to reduce the demand for energy, than energy savings should become our priority. Unfortunately what studies show is the reverse. It is a more competitive market (less dependency) which creates incentives towards efficiency because it can encourage efficiency through price signals.

That is why market reforms could play a role in increasing energy efficiency levels. Europe urgently needs a common energy market.

The most cost-effective policy to increase energy efficiency is actually the creation of a well-functioning market for energy services, which would enable free trade in energy through modern and integrated cross-border transmission networks. Naturally there are still immense regulation and infrastructural needs. Some of the barriers can be eliminated to increase the energy efficiency levels at hand.

First of all, there is investment needed to encourage R&D to ensure the development of energy saving technologies and the diffusion of these. The European Energy Efficiency Fund, which has just recently been launched, should be a first step.

Secondly, the consumers' information gap has to be challenged. An easy and free access to data on energy consumption is necessary to close that gap.

It won't be possible without additional investment from the businesses' themselves. Solutions such as smart metering and changes to billing systems are rather costly. With appropriate regulation governments may provide incentives for that as well. It is proven that these simple solutions can bring a large difference in the total of energy savings.

Last but not least it must not be forgotten that the European economy will not become more energy-efficient by reducing energy consumption only. Without economic growth, expressed in the gross domestic product surplus, Europe will stay trapped in a crisis.

Energy needs to be seen as a key driver for growth.

Research activities at the Polish Academy of Sciences in the field of renewable energy resources

Prof. Jan Kiciński

Within the next ten or twenty years Poland is expected to considerably transform its energy sector from a purely centralized large-power single-generation fossil-fuel coal-fired industry towards a model distributed cogeneration with a diversification of energy sources and considerable increase of renewable sources in the energy balance. The necessity of this transformation partly comes from the increasing degradation of the old power plants and bad distribution of transmission lines, partly from the obligation taken by the EU countries under the so-called climate package to reduce the level of emissions of carbon dioxide and other harmful substances.

Sample quantitative gains from cogeneration are displayed in Fig. 1. As seen from the picture, in order to produce 21 units of electric energy and 33 units of heat in cogeneration (assuming the theoretical total cogeneration efficiency of 90%) there are 60 units of primary energy required, whereas 97 units of primary energy are needed to produce the same amount of final energies in separate generation.

Main research activities at the Institute of Fluid-Flow Machinery of the Polish Academy of Sciences in the field renewable energy resources concentrate of biomass/biogas technologies, cogeneration, small wind and water turbines as well as hybrid RES. These works are conducted under several R&D project such as:

"Model agro-energy complexes in distributed cogeneration of heat and power" – Key Project of POIG (National Operational Programme: Innovative Economy) and

"Advanced technologies for energy production. Task 4. Elaboration of integrated technologies for the production of fuels and energy from biomass, agricultural waste and other waste materials" – Strategic Programme of NCBiR (National Centre for Research an Development).

The main goals of research works are:

- elaboration of technologies for the production of biofuels integrated with cogeneration of electric energy and heat (CHP),
- elaboration of

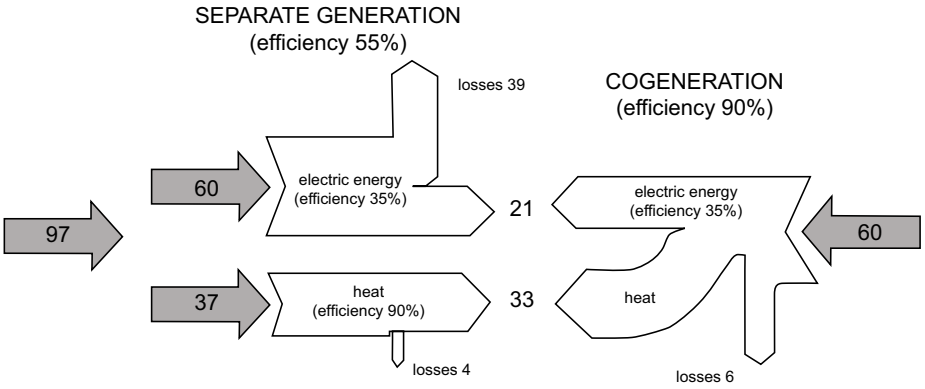

Fig. 1. Production of electric energy and heat in a separate mode and in cogeneration

documentation of a series of distributed energy systems, preparation of demo instalations ready for implementations in energy industry and in individual house-holds.

Among the elaborated technologies for the production of fuels are those of high-temperature gasification of waste biomass to the so-called synthesis gas, fermentation of green biomass and manure to biogas, biorafinery of wooden biomass to liquid biofuels. Cogeneration of electric energy and heat from biofuels involves theoretical, numerical and experimental investigations of combustion of low-caloric gases in piston engines and gas turbines as well as the development of supply and ignition control systems for cogeneration engines fired by low caloric gases.

Another investigated biomass technology is based on direct combustion of solid biomass and cogeneration of electric energy and heat in steam or vapour turbines and involves investigations of problems of combustion in biomass boilers and heat recovery from technological processes, as well as investigations of expansion and properties of low-temperature boiling organic Rankine cycle (ORC) fluids. It is important to note that biomass technologies assure a near-zero CO_2-emission cycle and reduce other harmful emissions to the atmosphere.

Several demo instalations ready for implementations in energy industry are developed, including professional cogeneration plants based on biomass/biogas sources, installations for pufirication of biogases, biomass drying and processing plants. Also a number of small and micro-scale energy installations are prepared ready to implement in individual house-holds such as fermentation and pyrolitic microbiogas reactors and waste utilization systems as well as micro-CHP stations(Fig. 2 and 3).

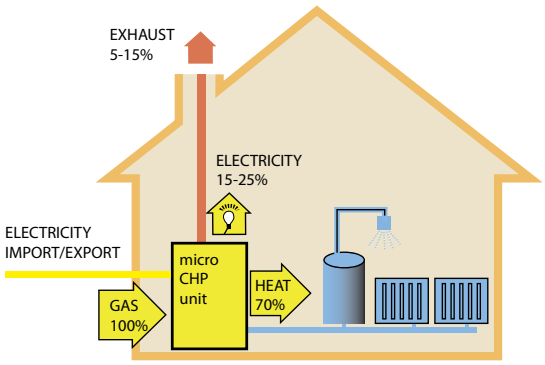

Fig. 2. Micro CHP concept (home power plants) developed in IFFM of the Polish Academy of Sciences

Fig3. The rotor of the micro-turbines (P=3 KW, N=8000 rpm) and new generation of biomas boiler (20 KW) tested in IFFM laboratory of the Polish Academy of Sciences.

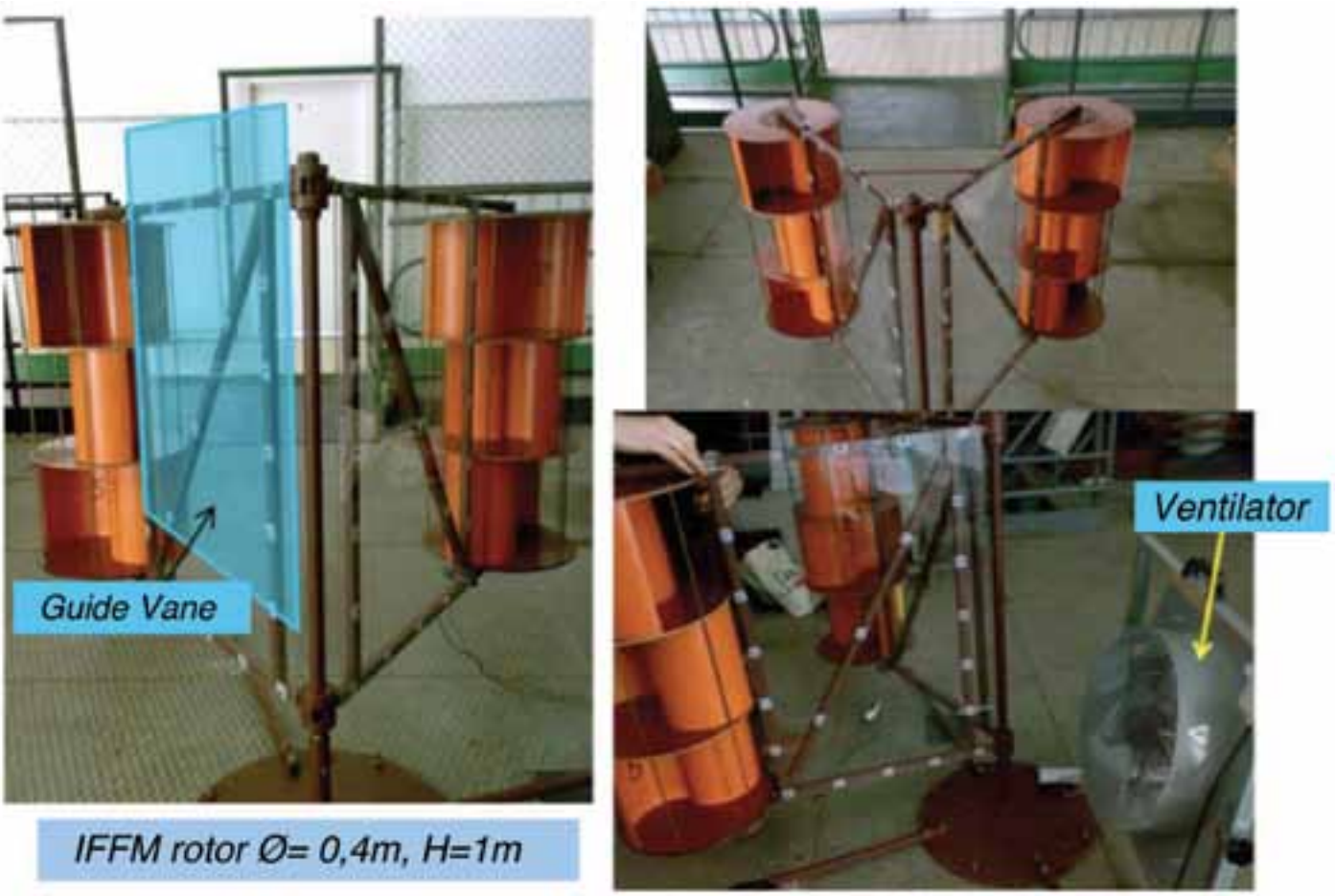

Fig. 4. Small wind turbine (P= 2 KW) elaborated in IFFM Laboratory. IFFM patent pending design.

Research investigations at the Polish Academy of Sciences concentrate also on the development of small wind turbines for individual households (Fig. 4) and low-head hydro power stations. Hybrid energy systems such as wind turbine / photovoltaic cells / diesel engine / energy accumulator are also investigated. They overcome shortages of a single source, guarantee continuous supply as well as less fuel consumption and emissions.

The results of scientific investigations are spread along Poland and other countries through a number of promotional programmes such as:

"The Baltic Sea Bioenergy Promotion Programme" (INTERREG IV),
"Border-free energy care",
"Environment-friendly energy development of communes (gminas)" – both projects supported from the NORWEGIAN FINANSE MECHANISM.

europia european petroleum industry association

Oil fuelled innovation

Technological innovation in oil fuelled engines will contribute to managing a transition to low-carbon mobility whilst safeguarding its competitiveness.

As the EU seeks to set in place an energy roadmap to transition Europe to a low carbon future, it must be sure to safeguard growth and mobility in the process. While the Europe 2020 Strategy and other initiatives set ambitious targets for energy savings and emissions reduction, in practice, the transition to a competitive, low carbon economy will be gradual and take several decades.

AFFORDABLE MOBILITY IS KEY FOR EUROPE'S COMPETITIVENESS

Europe will require a secure, reliable and affordable energy source to underpin economic growth during this transition phase.

Mobility is of course vital for the EU economy and today 90% of EU transport is fuelled by oil. Even the most optimistic scenarios from the International Energy Agency predict that oil will represent at least 70% of fuels for transport in 2035.

Oil and oil refined products will continue, to make an important contribution to EU growth. They offer a secure supply of energy that delivers affordable mobility and economic value and without a robust domestic refining industry Europe will be more dependent on third countries.

TECHNOLOGICAL AND EFFICIENCY IMPROVEMENTS IN INTERNAL COMBUSTION ENGINES WILL ENABLE HUGE CO2 EMISSION REDUCTIONS

It is essential to maintain the economic and social value of cost-effective mobility during the transition and the good news is that further efficiency improvements and lower carbon fuel options in classic internal combustion engines could achieve the EU's policy objectives for a low carbon society. Transport is among the least cost-efficient sectors to reduce emissions and placing greater policy focus on delivering fuel efficiency gains in oil fuelled engines could offer a substantial and cost-effective contribution to CO2 reductions in the transportation sector.

The oil industry works in close cooperation with the car and engine industry in developing new fuels for use in the advanced, fuel-efficient engines of the future. In the domestic vehicle sector a great deal has been done already and we believe that with new vehicle design, new engines and lower carbon fuels, we can also achieve fuel efficiency in Heavy Duty Vehicles of up to 20% in the next decade. The same is true for the Aviation sector where a reduction of 25-50% in fuel consumption could be achieved through more efficient aircraft design and operation, and 25-75% CO2 reductions are also possible in the Marine sector.

Isabella Muller, Secretary General of EUROPIA

TECHNOLOGY MANDATES OR PRESCRIPTIONS SHOULD BE AVOIDED

A clear policy framework could enable the EU to meet its new energy efficiency and emissions targets. Comparative cost analysis for both society and the environment should be carried out on all new forms of energy and transportation, and we must avoid mandating specific technologies that might prevent the EU from leveraging new innovations in the future. With the consistent application of energy taxation levels to all energy products and a framework for consistent and predictable CO2 abatement costs across the entire economy, the EU can achieve its dream of lower carbon future without jeopardizing the industrial value chain, the economy and jobs in the process.

Promotion of Energy-Efficient Appliances

International reports reveal that 44% of electrical energy domestic consumption comes from energetic labeled household appliances and equipments. For this reason is crucial to develop activities that promote the use of more efficient appliances and equipments, and measures that improve the quality and effectiveness of the information available to consumers at stores.

European Union is focused in increasing the energy efficiency as a strategy to meet the objectives of Europe 2020. As a consequence of this position, there are several European projects which main goal is to reduce the energy consumption of these electrical appliances. Promotion 3E - The Promotion of Energy- Efficient Appliances in Europe (http://www.promotion3e.ips.pt) is one of these. Running from October 2008 to September 2011, Promotion 3E is supported by the Intelligent Energy for Europe (IEE2).

The project focus was placed on training appliances' sales personnel, assuming that well informed customer will tend to purchase highly energy-efficient appliances (energetic labeled appliances: washing machines, drying machines, dish washers, refrigerators, electric ovens, air conditioning devices, light bulbs).

These highly energy efficient appliances tend to be more expensive and with more high-tech functionalities, which difficult comparisons, so it is very useful to have a skilled seller to advise the consumer, regarding the energetic and environmental advantages. One of the most important levels of decision rely in the appliances stores, that's way advises from qualified sellers are so important towards the energy efficiency goal.

Promotion 3E started with an information and support activities for stores, in order to establish a network of participating household appliances stores and to produce a Protocol Agreement signed and agreed by these participating stores, in the eight UE countries on the project (Portugal, Spain, UK (North Ireland), France, Greece, Italy, Germany and Poland).

Simultaneously, it was performed an international study on training needs, through 1432 interviews with electrical appliances stores' customers, in order to identify their purchasing habits and their decision making process. Some of the main results are the following:

Habitual reasons to buy:

58.7% because "the old one broke" and 31.4% "I don´t have one";
Information sources: 35.8% store employees, 26.6% internet and 9.3% family/ relatives.
Most important general choice elements: 42.3% Cost, 39.9% Quality, 32.5% Price vs. quality and 25.1% energy consumption.
Most important environmental choice elements: 40.8% energy efficiency, 23% energy labeling class, 20.7% water consumption and 16.9% sustainable materials.

The next step was developing sales staff training among the stores engaged, in order to train sales personal on energy efficient appliances, improving their skills and the quality of information transmitted to the customer. The e-learning methodology was very important in the project development, giving the opportunity to cover a wide geographical area of stores, since there wasn't enough resources available to perform on store sessions and this methodology has also given the possibility to deal with one of the major challenges felt during the project implementation, the constant changes in sells personnel, common to most countries.

As a result of Promotion3e implementation, 456 protocols have been signed with retails and independent stores in Europe. The project enrolled more than 600 stores and trained more than 1300 sellers.

After the training, the project has created a labeling system for the participating stores, based in the following process: the stores, whose sellers were trained, were sponsored with promotional material and best practice banners to be fixed on the appliances. These stores are also promoted on the project web platform. In order to evaluate the process, some of the stores were submited to a mysterious client visit.

The results will be measured by the change in the percentage of more efficient appliances on the overall appliances sales. The main objectives for the network stores engaged in the project were: increase in 20% of the market quota appliances class A and A+, and 5% on Class A++.

The final results on the percentage of more efficient appliances, will be published by the end of the project, however from interim analysis it's possible to report some trends.

Germany seems to be undergoing a domestic appliances market change towards more energy-efficient equipments, regarding specifically the refrigerators and freezers, tumble driers and air conditioning equipments. However, Spain gives contradictory signals. Nevertheless, most of the appliances sales show the same positive trend as Germany, for appliances such as dishwashers, refrigerators and freezers, the sales of the higher efficiency classes decreased. This decreasing trend was also observed in Portugal for clothes dryers and, more slightly, for refrigerators and freezers.

For refrigerators, freezers and combinations most of these equipment sold in participating stores is classified as A, A+ or A++, all considered to be "energy-efficient" equipment. Italy stands out for having made further progress to the most efficient energy classes due to national legislation and incentives (over 90% A+).

Class C equipment nearly disappeared from participating stores and class B presence is also very small for refrigerators, freezers and their combinations, washing machines, and dishwashers. Tumble dryers are the only appliance type with higher dispersion between the classes and where most of the equipment sold is labelled as B or C.

We can conclude that:

1. The project has been a success, confirming that well trained sellers improve energy efficient appliances sales;
2. Grants to energy efficient appliances drive to an improvement in sales, reducing the usual gap between prices.
3. Legislation which forbids less energy efficient appliances is off course the most effective way.
4. Appliance manufacturer should make available simpler energy efficient appliances, since the most high efficient equipments tends to have also more advanced functionalities, making difficult to compare the economical and environmental issues.

Hydropower innovations

The Emosson Arch dam, at the border between Switzerland and France, has created the second largest reservoir in Switzerland. It can impound a maximum storage volume of 227 Million cubic meters. A new pumping storage plant is being built in Nant de Drance, with 6 x 157 MW pump turbines. When completed, in 2017, it will deliver 942 MW during the peak periods. On the picture, just above the lake level, one can see the intakes for the future pumping storage plant, which will be situated entirely into the mountain.

Managing the balance between energy production and consumption has always been a key problem for the utilities. When you forget the crucial importance of the stability of electrical network, the reality strikes back hardly : this is what happened with the 2006 blackout in Germany, which reached all the continent, after having been amplified by the windmills. (See Reference)

That problem is becoming even more important with the expected increase in the use of both nuclear plants and renewable energies. Nuclear plants can adapt to the variations of consumption, but only in a limited way and with a lowered efficiency. Renewable energies like solar and wind are intermittent by nature, sometimes unpredictably, like in the case of Germany 2006. In March 2011, German Economics Minister Rainer Brüderle warned that Germany was facing frequent power blackouts because too much

'green electricity' is being pumped onto the grid.

The stability of the network needs therefore means to store power in grid scale amounts. There is only one known mean to store power in an economic and flexible way: pumping storage power plants. In those specific plants, pump turbines transfer water to a higher storage reservoir during off-peak hours, thereby leveling out the daily generated load. The stored water can then be used for hydroelectric power to cover temporary peaks in demand.

This technology can come online very quickly, in a few minutes, where gaz turbines need dozens of minutes, fuel plants need hours and coal or nuclear plants need days. This advantage is generally shared by all hydropower plants, but in the hydropower lakes, water is used only once. With pumping storage plants, water is used as many times as necessary.

The inescapable development of renewable intermittent energies imposes to develop huge means of storage. Unless unexpected breakthroughs in batteries technology or elsewhere, most of that storage will therefore be implemented in the form of pumping storage plants.

There are now already some 350 pumping storage plants in the world representing 130 GW capacity. Recently the profitability of those plants has increased, as a consequence of the price volatility on electricity spot market opened by European power deregulation. Power bought at low prices during the night is used to store water, later released in the turbines to produce during peak periods, when MWh price is at the highest level.

According to Jean Lempérière, a worldwide dam expert and president of a Technical Committee of ICOLD (see Box), "hydropower is now developing fast in the emerging countries and we can expect a doubling capacity by mid-century, from 950 GW to about 2000 GW. The hydropower world generation will go from 3500 today to 7500 TWh/year in 2050."

But in the same time renewable energies and nuclear are expected to massively develop and thus, hydropower generation will probably stay under 20% of the total. Lempérière evaluates the need for storage at about half the average wind and solar supply in 2050 and says that "in 2050 some 1000 to 4000 GW of pumping storage capacity will be needed", to be compared with the 5000 GW installed capacity for solar and wind expected by 2050. This would lead to a construction rate faster than the classical hydroelectricity installations".

Lempérière has proposed different systems of sea based pumping storage stations, using the sea as the lower basin. Structures around 50 m high and operated between 30 and 50 m above the sea level could store about 1.5 GWh/km2 . Another solution proposed would be "Emerald lakes": large 100 km2 offshore basins, using 35 km of dykes. Lempérière estimates the cost of the storage at about US$10 per kWh. According to him, large investments in those new tools for storing power are the only way to compensate the intermittent nature of renewable like wind and solar.

Reference: UCTE – Final Report, System Disturbance on 4 November 2006

ICOLD : mission statement
The International Commission on Large Dams (ICOLD) is a non-governmental International Organization which provides a forum for the exchange of knowledge and experience in dam engineering. Created in 1928, it groups 95 member countries. ICOLD wishes to be the world's leading professional organization, dedicated to advancing the art and science of dam engineering and promoting the wise and sustainable development and management of world's water and hydropower resources.
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Michel de Vivo, Secretary General
ICOLD-CGIB (International Commission on Large Dams)
76 Avenue Kléber, 75116 Paris, France
T +33 1 47 04 17 80

Solar photovoltaics competing in the energy sector

By Ingmar Wilhelm, President of the European Photovoltaic Industry Association (EPIA)

Solar Photovoltaic (PV) technology has shown impressive price reductions over the last 20 years, with the price of PV modules decreasing by over 20% every time the cumulative sold volume of PV modules has doubled. Importantly, there is a huge potential for further generation cost decline: around 50% until 2020.

But already today, PV electricity is cheaper than many people think. In the coming years, the technology will become even more cost-effective and competitive — and qualify therefore as a vital part of Europe's energy future.

A new EPIA analysis of the five potentially largest electricity markets in Europe (France, Germany, Italy, Spain, United Kingdom), carried out with the support of the strategic consulting firm A.T. Kearney, shines new light on the evolution of Europe's future energy mix and PV's role in it. The study "Solar Photovoltaics Competing in the Energy Sector" shows that under the right policy and market conditions, PV can be competitive in some markets as early as 2013 and then spread all across the continent in the different market segments. That means it can be a major contributor to the EU's goal of 20% renewable energy sources by 2020.

Before the end of this decade, PV will offer every European citizen the chance to become a "prosumer," producing and consuming his or her own electricity at a competitive price. Competitiveness of PV electricity for consumers (referred to as "dynamic grid parity") can be defined as the moment at which, in a particular market segment in a specific country, the present value of the long-term revenues (earnings and savings) of the electricity supply from a PV installation is equal to the long-term cost of receiving traditionally produced and supplied power over the grid. While the cost of generating PV electricity will reduce sharply in Europe in the coming decade, the study also shows that any further increase of electricity prices will shorten the time needed for PV to become competitive.

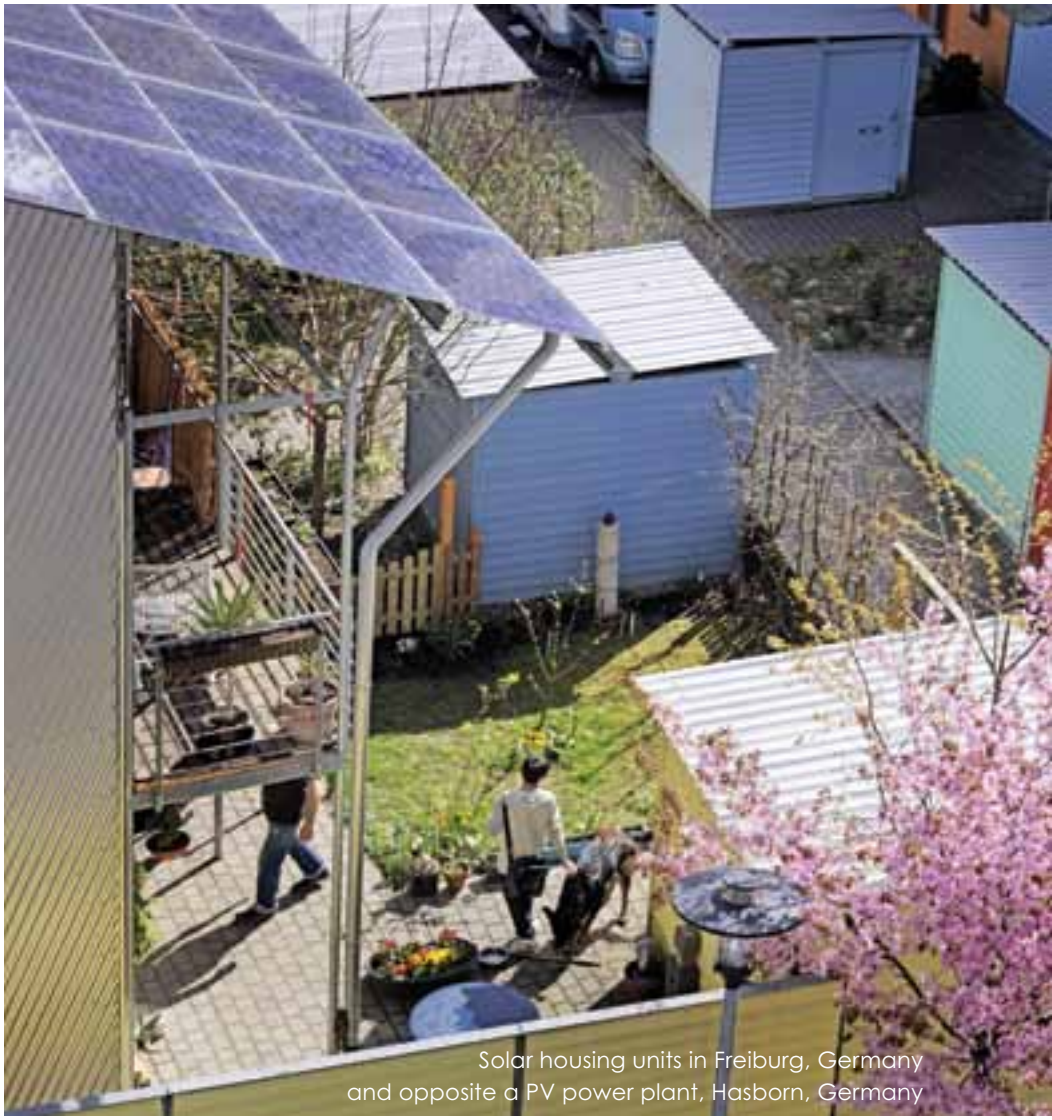
Large ground-mounted PV installations and large-size industrial rooftops will also become more

attractive from an investor's point of view. Generation value competitiveness, which refers to the moment at which, in a specific country, adding PV to the generation portfolio becomes equally attractive to investing in a traditional and normally fossil-fuel based technology, is foreseen to be reached as early as 2014 in some markets and could then spread out across Europe to many additional countries by 2020.

Smart deployment of support mechanisms, such as Feed-in Tariffs (FiTs), has helped PV gain a market foothold in many countries of the world, compensating for the difference in cost competitiveness between PV electricity and that of conventional sources.

As that competitiveness gap narrows for the PV sector, due to technology development and parallel decrease of generation cost, PV will be able to rely progressively less on dedicated financial support, leading to the phasing out of such support schemes. This will happen even quicker if internalisation of external effects is implemented for all technologies and subsidies to other energy sources are also phased out, leading to a truly level playing field.

Renewable energy sources, including PV, will be essential to achieving Europe's important goals of reducing greenhouse gases and guaranteeing the security of a safe and local energy supply. Encouraging PV development will also play a major role in the EU effort to create a smart, sustainable economy for the future – one in which high-tech innovation creates new jobs and improves also social cohesion. In any case an appropriate regulatory framework and favourable market conditions will be needed to ensure that PV can roll out its full and increasingly promising potential in our future energy mix.



Solar housing units in Freiburg, Germany and opposite a PV power plant, Hasborn, Germany

One message here is clear: Switching to solar photovoltaic electricity is not just a desirable option for achieving our energy and environmental goals; it is also a realistic and competitive one.

Read the full EPIA report at www.epia.org/publications

European PV Research and Development – Updating the Research Agenda

Nicola M. Pearsall

Northumbria University, UK

Chair, Working Group on Science, Technology and Applications, European Photovoltaic Technology Platform

In recent years, the installed capacity of photovoltaics around the world has increased at a remarkable rate, particularly in Europe where around three quarters of all installations are to be found. This growth has been accompanied by a reduction in cost that is predicted to lead to PV generated electricity being cost-competitive with retail electricity in many countries well before the end of the decade (see, for example, recent reports by the International Energy Agency and the European Photovoltaic Industry Association).

Research and development into new device technologies, device manufacturing, PV system components and system operation is crucial to ensure continuing technology advancement, cost reduction and industry competitiveness. In 2007, the European Photovoltaic Technology Platform published a Strategic Research Agenda (SRA), which aimed to define the R&D activities required to reach the ambitions for PV defined by the European PV community at that time. That document has been used as input to the definition of PV research in the Seventh Framework Programme of the European Union and in the coordination of research programmes in and between European Member States.

In response to the rapid development of the market and the increased ambition for the adoption of renewable energy in Europe by 2020, the Science, Technology and Applications Working Group of the Platform has updated the SRA. The second edition of the SRA is intended to perform a similar function to its predecessor.

WORKING GROUP

The members of the Working Group are drawn from all sectors of the PV community, from both research and industrial organisations, and their knowledge covering all relevant technologies. Periodically the membership of the Working Group is refreshed via a call for candidates on the Platform web site. In developing the SRA, the opinions of other experts from both within and outside the PV community were also sought.

R&D GOALS

In setting the overall R&D goals addressed by the SRA, the short-term targets were chosen to be in line with those of the recently established Solar Europe Industry Initiative, which is part of the SET Plan. The medium and long-term targets reflect the continuing potential of PV to reduce costs and contribute substantially to meeting Europe's electricity needs. This edition, like the previous one, challenges all PV technologies to meet the same overall targets for energy cost and environmental performance. Within separate sections on the different PV technologies, including crystalline silicon, thin film approaches and concentrator devices and systems, more specific targets are set for each case. At the system level, requirements for the large scale integration of PV systems into the electrical grid and into buildings are emphasised.

One of the most interesting aspects of the preparation of the updated SRA was to assess the progress that had been made in relation to the technology goals set out in the 2007 version. It was gratifying to see that, although of course the medium and long-term research goals remain to be achieved, many of the short-term objectives have been met and, in several cases, exceeded. These include increases in efficiency across many device technologies, reductions in material usage, advances in manufacturing yield and capacity and reduced environmental impact.

The second edition of the Strategic Research Agenda for Photovoltaic Solar Energy Technology from the European Photovoltaic Technology Platform will be launched in early September at the 26th European Photovoltaic Solar Energy Conference and Exhibition in Hamburg. Further information can be found on the PV Platform web site, www.eupvplatform.org.

Photovoltaics in smaller markets: perfect cooperation between two partners

Photovoltaics is becoming increasingly important in smaller markets such as Eastern Europe. Very often, solar manufacturers are not yet present in these markets. This makes partnerships with local installers all the more important. However, building a photovoltaic system requires certain expertise. Centrosolar, manufacturer of complete PV systems 'Made in Germany', understands the importance of teaching this know-how. The German company is offering targeted training courses to support its installers abroad.

"Our installers in other countries are like an extension of us," explains Torsten Lütten, Director of New Markets at Centrosolar. "Because the photovoltaics market is growing so rapidly, we still don't have subsidiaries in many regions. So it's especially important for us to find installation partners who want to work hand in hand with us." With this goal in mind, Centrosolar is providing its international partners with comprehensive support. This includes sales literature in the local language as well as professional training courses on photovoltaics and related products. It's an investment for installers, but it's one that pays off quickly.

Zdenko Vrecic, CEO of Fotovolt in Cankova, Slovenia, is very impressed with the quality delivered by Centrosolar, the company's German partner. Fotovolt provides complete systems with high-quality components from a single source. The 'Made in Germany' seal of quality is a selling point for the Slovenian installer: "For us it is extremely important that the modules are premium class, as most of our customers require modules with the best

Zdenko Vrecic (right) and his team of Fotovolt d.o.o.

CentroSolar

quality and of notable origin," Vrecic explains.

GERMAN ENGINEERING, INTERNATIONAL MARKETS

The companies that merged to form Centrosolar AG in 2007 are pioneers in the photovoltaics industry. As a result, Centrosolar can draw on decades of experience in the field of solar technology. The company's success is based on a combination of world-class German engineering and a systematic strategy of international expansion. Today, Centrosolar has subsidiaries in the US and Canada and many European countries such as France, Spain, Italy, the Benelux countries, UK and Greece. The photovoltaics specialist employs over 1,000 people worldwide.

To ensure the high quality of its modules, the company still manufactures its products in Germany. Centrosolar offers a ten-year product warranty on the modules it manufactures. These products are used worldwide for grid-connected solutions as well as for stand-alone, off-grid systems where silent and reliable power supply is required.

BEYOND THE DELIVERY OF GOODS

Centrosolar's installation partners already have a solid background if they are in the roofing, plumbing, heating and air-conditioning or electrical installation industries. If not, installation companies can receive training in photovoltaics and acquire a basic technical grounding in the subject. Frequent questions include: Which modules will work best for a certain building? Monocrystalline or polycrystalline modules? Should the system be tailored or prefabricated? Is a flat roof, an in-roof or on-roof solution required? Which is the best inverter for the system? Which mounting system should be used? Centrosolar offers a wide selection of professional photovoltaic solutions as a one-stop-shop.

With solid expertise, the company guides its international partners through decision-making processes and helps them quickly gain the expertise they need. "The partnership with Centrosolar is extremely meaningful for us, as it does not simply mean delivery of goods. It's a very professional and close cooperation. For each project we are looking for an optimal system design together," says Zdenko Vrecic.

THE ESSENTIALS IN JUST FOUR DAYS

Centrosolar teaches its partners the basics of photovoltaics during four-day training courses in Germany. On the first day, participants take a tour of the 350 MW production facility at the Wismar site in northern Germany. The course continues at the training centre in Paderborn. A whole day is devoted to the complex topic

Our production site in Wismar, Mecklenburg-Western Pomerania

CentroSolar

Complete system S-Class Excellent

of inverters. Inverters take the direct current that photovoltaic modules generate from the sun's energy and convert it into alternating current so that it can be used by the grid. If the inverter isn't perfectly adjusted to the whole system, large amounts of energy may be lost or the system may even fail. Correct adjustment is also the key to ensuring return on the investment and best customer satisfaction.

As part of its expansion into new markets, Centrosolar is continuously looking for new partners who are ready to branch out into the profitable photovoltaics sector. Thanks to the solar business, Zdenko Vrecic has already secured a competitive edge and would like to build on this success: "We do believe that thanks to this cooperation we will pursue our success in Slovenian PV market." "This proves that our support program works for our international partners", Torsten Lütten beams. "More partners are welcome to meet the overwhelming demand." ●

Centrosolar AG
Stresemannstrasse 163
D-22769 Hamburg
Germany
Tel. +49 40 391065-0
Fax +49 40 391065-99
hamburg@centrosolar.com
www.centrosolar.com

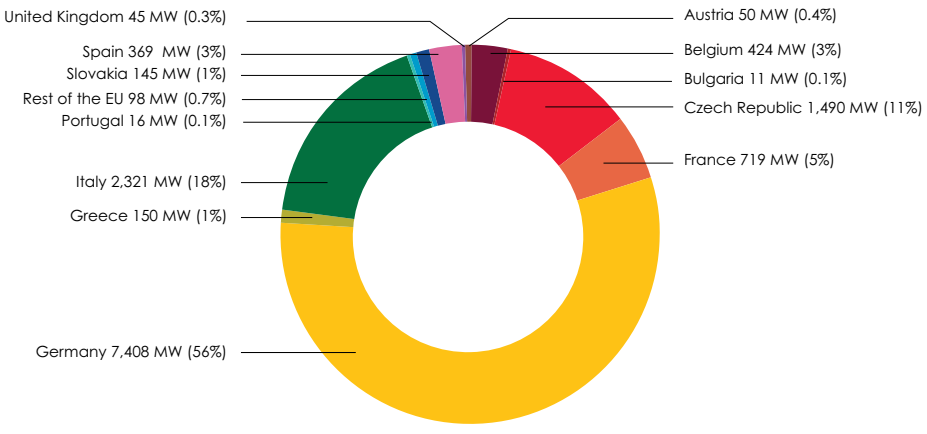
Solar Concentrated Thermo-Photovoltaic Collectors (CTPV): a new technological frontier for the PV market?

Authors: Prof. Maurizio De Lucia (delucia@unifi.it), Eng. Davide Fissi, Eng. Christian Paolo Mengoni, Eng. Stefano Toccafondi

Over the past decade, the photovoltaic (PV) market has experienced a huge growth and in 2010 reaching a cumulative capacity of 40 GW world-wide. The PV market growth has been driven by the decrease of manufacturing costs and has been accelerated by local support schemes such as incentives for the installation and specific regulations. In 2010 Germany overshadowed other European markets, even if Italy with more than 2.3 GW total capacity, has been at the same level. Other EU countries like the Czech Republic, however, put the total PV installed capacity per habitant (191W per habitant) of the country at the same level than Germany (211W per habitant) at the end of 2010.

Nowadays, even if investments in the electricity sector are driven more by financial interests than network stability issues there is a global trend to redirect investments into renewable energies rather than coal/nuclear. The other renewable energy sources are also progressing, but without

Fig. 1 2010 EU market share (MW, %) [EPIA – Global Market Outlook for PV until 2015]



reaching high levels of PV and wind.

The European Photovoltaic Industry Association (EPIA) derived two scenarios for the future development of the PV industry and provided their results for the forecast of the PV market growth [Fig. 2]. The "moderate" scenario assumes a business-as-usual market behavior with no major reinforcement of already existing support mechanisms. The "policy-driven" scenario assumes the continuation or introduction of new support incentives accompanied by a strong political consideration of PV as the major power source in the coming years.

Despite of the continuous growth of the investment into solar technologies, the landscape for the EU is not bright as it seems, because, even if some local markets are going to develop further (Czech Republic, Greece, Austria), in biggest countries the PV market growth is declining or even downturn, at least until 2012.

In that landscape R&D activities on innovative PV technologies are mandatory in order to propose to better and new solutions to support a continuous growth of solar energy systems, and for struggling local opposition to the use of PV plants.

Many research activities recently are focused on the development of PV cells with higher electric efficiencies at higher temperatures. Efforts

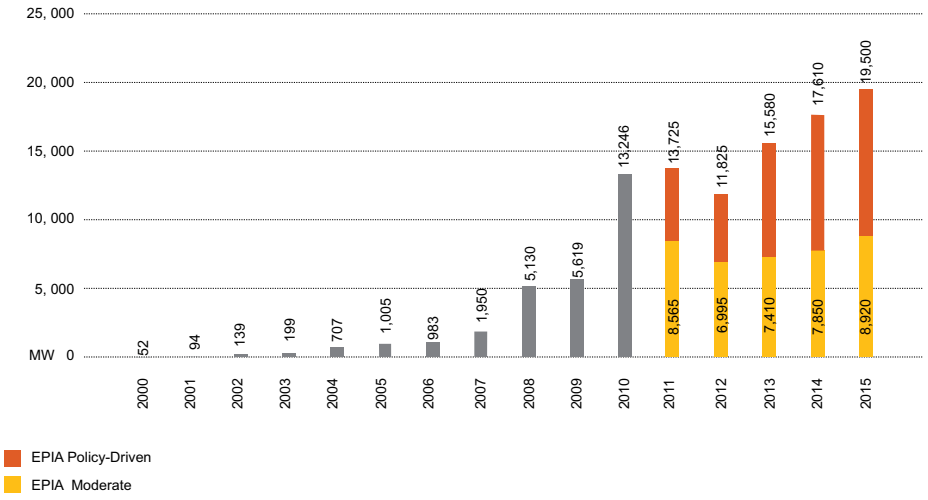


Fig. 2 European annual market scenarios - Moderate and Policy-Driven [EPIA – Global Market Outlook for PV until 2015]

Fig. 3 – CESARE's lab-prototype of CTPV collector at the University of Florence

Fig. 4 – "CESARE" CTPV receiver tube incorporating multi-junction GaAs PV cells

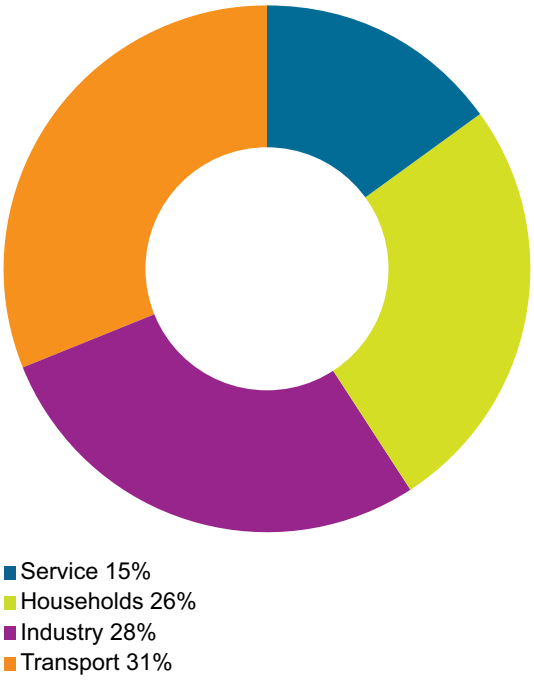


Fig. 5 – EU 27 Heat Demand by sectors for temperatures below 150°C in 2006: Total 4640 TWh [ESTIF, Potential of Solar Thermal in 2010]

have been also focused on the use of special techniques for the manufacturing of PV cells like the Thin Film technology or rather the PVD deposition. Thin film technology is mainly used for standard flat PV collectors where an increasing of efficiency would reach values of 18-20%. The PVD technology is specifically used for PV multi-junction cells for solar concentrating applications, and allows efficiency up to 25% while operating at temperature in a range of 50-90°C.

One of the most interesting solutions for future of PV is the solar concentrated thermal/ photovoltaic collector (CTPV), a system that is able to supply to the user both electric energy and heat at temperatures useful for the production not only of Domestic Hot Water (about 50-60°C), but also space heating and/or cooling (about 70-90°C) using in series with adsorption or absorption chiller.

Generally, one important problem in PV collectors is related the operating temperature of the cells, since the electric efficiency decreases increasing the operating temperature. In standard flat PV collectors no heat dissipation equipment is foreseen, on the contrary, concentration (CTPVs) require heat dissipation equipment that allows to control the cells temperature optimizing the system's efficiency.

In last years the University of Florence has been developing a 2-axis solar CTPV system of about 15 m2 of collecting area [Fig. 3], based on a linear concentrator with parabolic shape (developed in cooperation with CNR-INO) were GaAs multi-junction PV cells (developed by CESI spa) are installed in the receiver tube designed for support the cells and to dissipate heat [Fig. 4].

First tests highlighted that the system is able to generate power for 2.4 kW and heat for 6-7 kWth while operating at about 60-70°C with.

The research project "CESARE" financed by local authorities allows the development of new PV technologies to be introduced into the Italian market. The University of Florence is also involved in other project in cooperation s with very industrial partners and leading companies in this sector such as ENEL spa, ST Microelectronics, Riello spa with the aim to industrialize CTPV systems.

Such a solution would be extremely interesting for the residential application and/ or for commercial sectors considering that the "only-PV" photovoltaics market in EU could be even negative, in coming years. In the meantime in EU the heat demand at temperature lower than 150°C has been 4640 TWh. The households sector represents the 26% of the overall heat consumption as well as the service sector (15%) [Fig. 5]

AVERE

The European Association for Battery, Hybrid and Fuel Cell Electric Vehicles – founded in 1978 in order to promote the widespread use of electric vehicles in Europe and Africa - is a non-profit making organisation and European network of predominantly national associations whose members include Users, NGOs, Associations, Interest groups, Public Bodies, Research & Development Entities, Vehicle & Equipment Manufacturers and Electricity Utilities.

Today, its main objective is to champion the use of Battery, Hybrid and Fuel Cell Electric Vehicles as the principal means of powering personal, fleet and freight transportation.

In this manner, AVERE is leading the way to a green and sustainable mobility.

To achieve this objective, AVERE has several activities such as:

- Dissemination,
- Participation in European and multilateral projects,
- Lobbying,
- Research and development,
- Monitoring,
- Networking,
- Facilitating studies by means of working groups,
- Collaborating with other international bodies with common interests,
- Organising conferences.

AVERE's mission also includes:

- Supporting collaboration between its members in Scientific and Technological Innovation

and

- Representing the interests of the Electric Drive Industry and Research & Development institutions to the European Commission with respect to the development of clean vehicles.

AVERE has already participated in several European projects funded by the FP7, two of which are currently in progress:

1. MERGE evaluates the future impact of the interoperability of electric vehicles and electric distribution network

2. SAFEDRIVE is the conception of a new type of electric drive train for electric vehicles.

AVERE operates not only at a European level but also at regional, national & international levels:

With AVERE – covering Europe and Africa, EVAAP - Asia Pacific, and EDTA – Americas; the 3 organisations form the World Electric Vehicle Association (WEVA).

Periodically, AVERE, EVAAP and EDTA hold International Electric Vehicle Symposia.

In 2012, it will be the 26th EVS which will take place in Los Angeles, CA on May 6-9. The EVS27 will take place in Barcelona in 2013.

AVERE regularly participates in many national and regional events, conferences and workshops.

AVERE represents not only Electric 4-wheelers but has also a special involvement in Electric two-wheelers; particularly with its role as an Operating Agent of the Annex XI of the Electric and Hybrid Vehicle Implementing Agreement of the International Energy Agency (IEA).

In 2011, a new bureau has been elected for the next three years to take AVERE forward into a new era of Transport.

Composition of the bureau:

Philippe AUSSOURD, President (France)

Pietro MENGA, Vice President (Italy)

Angel AGHILI, Vice President (Spain)

Joeri VAN MIERLO, Vice President (Belgium)

Laurence DRUET, Treasurer (Spain)

Karine SBIRRAZZUOLI, Secretary General (Brussels)

AVERE
European Association for Battery, Hybrid and Fuel Cell Electric Vehicles
c/o VUB-FirW-ETEC
Bd. de la Plaine 2
1050 Brussels
T: + 32 (0) 2 629 23 63
Email : info@avere.org
Twitter: AVERE_EU
www.avere.org
www.ev-merge.eu
safedrive-fp7.eu

Electric vehicles: Large climate potential in the long term

by Bettina Kampman, senior researcher/consultant CE Delft and Huib van Essen, manager transport CE Delft

Electric Vehicles (EVs) are a promising technology for drastically reducing the environmental burden of road transport. From the perspective of a low carbon future, their most important benefit is that they can drive on a whole range of low carbon energy sources. This brings large scale low carbon or even zero-emission mobility within reach, in the long term. In the short to medium term, however, the technology is not yet mature and will remain dependent on government support and ongoing R&D efforts.

ELECTRIC VEHICLES IN THE EU

In recent years, a number of electric passenger cars have come on the EU market and most car manufacturers have announced one or more EV models for the coming years. It is clear that the industry is taking this technology seriously and that the vehicle market might be on the verge of quite a significant technological transformation.

However, EVs are not yet competitive. Costs are still high and battery technology is still being developed. R&D investments worldwide are impressive, and various governments, including many EU member states, support both the development and the sales of EVs. These efforts are expected to lead to cost reduction and performance improvements in the coming years and decades. However, it is also expected that it takes at least one to two decades before electric driving becomes competitive on a large scale, and independent from government incentives.

In this context, CE Delft, together with ICF and Ecologic, carried out an extensive study on the potential impacts of market penetration of electric vehicles in the EU, commissioned by the European Commission (DG CLIMA). The study covered full EVs (FEV), plug-in hybrid EVs (PHEV) and EVs with range extender (EREV). Impacts on both the transport and electricity sector were analysed as well as a policy implications.

EV MARKET DEVELOPMENTS STILL VERY UNCERTAIN

Successful battery development seems to be the most crucial condition for market uptake of this technology. Batteries have a strong impact on EV costs and electric driving range, two key parameters that consumers will look at when considering to buy an EV. In addition, a number of other issues will play a role, such as availability of charging infrastructure and/or battery swap stations.

In the study for the EC, future market developments and impacts were predicted for three scenarios:

- Scenario 1 was based on current best estimates of cost and performance development of EVs and conventional cars, and current government incentives.
- Scenario 2 assumed that ICE vehicles remain the prominent technology also in the longer term, with strongly improved fuel efficiency.
- Scenario 3 assumed fast

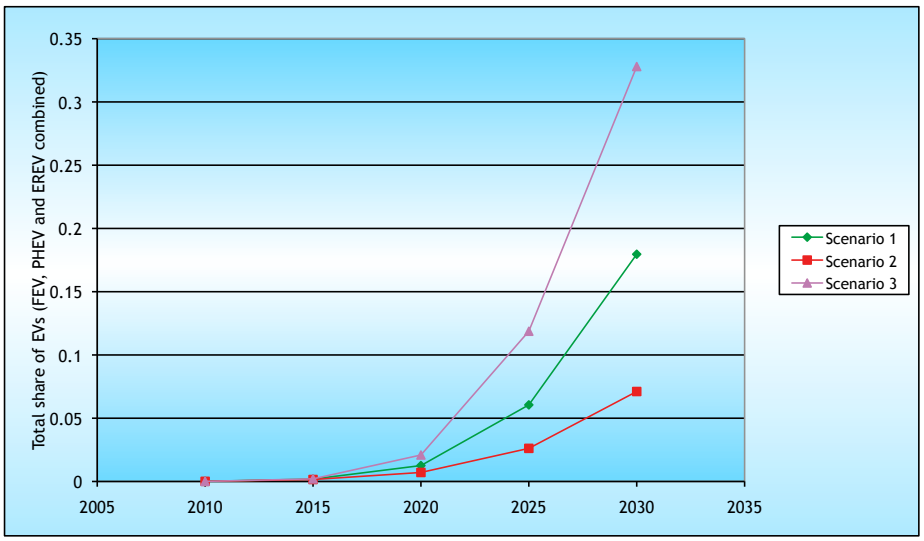


Figure 1 Total share of EVs in the EU car fleet, FEVs, PHEVs and EREVs

battery cost reductions and thus market uptake after 2020.

The total share of EVs in the EU car fleet in these scenarios were modelled, see Figure 1. Until 2020, the share of EVs will remain relatively low, but after that it could take up quickly, depending on the scenario. In all three scenarios, most of the EVs (about 60%) are expected to be Plug-in Hybrids.

The future EV market uptake will have a number of environmental and economical impacts. Petrol and diesel use will reduce, leading to lower greenhouse gas and air pollutant emissions of the vehicles themselves. On the other hand, electricity production will have to increase, leading to additional emissions in that sector (of which the CO2 emissions are covered by the EU Emission Trading System). In the study, various impacts are quantified, for the three scenarios given above.

POLICY RECOMMENDATIONS

Policies on many different levels (EU, national, cities) can play a role in EV developments and market uptake. In the short term, at least over the next five years, EV technology will not yet reached maturity and government support is needed to speed up innovation. In this phase, however, it is important to avoid unfair competition with other types of energy-efficient vehicle and sustainable biofuels. To prepare for the longer term, a consistent overall fiscal and regulatory framework should be developed, providing consistent treatment and coverage of EVs and all competing technologies.

All reports of the study 'Impacts of Electric Vehicles' (five background reports and one summary report) can be found at http://www.cedelft.eu/publicatie/impact_of_electric_vehicles/1153

The study was carried out by CE Delft, ICF and Ecologic.

Can Transport ever truly be called "Green"?

Michael Edmund

It is relatively easy to recognise the scale of the challenges faced by making the transport of goods and people "Green". Properly defining the solution may not be; and achieving it, very difficult indeed.

It wasn't the Exxon Valdez captain's driving that caused the Alaskan oil spill. It was yours.
- Greenpeace advertisement

Bitter-sweet. Open Secret. Virtual reality. To many people, the words 'Green Transport' might seem like a contradiction in terms; another modern oxymoron. And they might have a point: economic activity surely relies upon the transport of goods and people, and any physicist will tell you that moving an object over a distance involves energy somewhere in the process; it was in 1826 that French mathematician Gaspard-Gustave Coriolis first called that process "work".

Modern evidence confirms a surge in world energy consumption during 2010. According to Enerdata's 2011 Global Energy Statistical Yearbook, energy consumption rose 5.5% globally, and by 4% in Europe during that year. These figures correlate well with those for CO_2 emissions, which rose 6% globally and by 3% in Europe. The data should of course be interpreted in the context of a world rebounding from the financial crisis of 2008/9, but they clearly demonstrate the relationship between economic activity and CO_2 emissions.

But how does the electricity reach the car?

Siemens press picture

OR DO THEY?
In a thoughtful article in the Social Europe Journal last year, Jo Leinen, Chairman of the European Parliament's Committee on the Environment, Health and Food Safety, states that emissions in the European Union have "dropped slightly" during the last twenty years.

REALLY? A SLIGHT DROP OVER THE LAST TWENTY YEARS?
Indeed, according to the European Environment Agency (EEA), the EU-15's emissions are 6.5% lower than they were in 1990. So growth in emissions might not be inevitable, although it must be said that these figures may be interpreted in different ways. The point is that Leinen was arguing for a greater focus on Transport. He suggested that it will be the next step in Europe's Climate Strategy, citing Commissioner for Climate Action, Connie

Transport: at the focus of every aspect of power production and consumption?

Hedegaard, who will make Transport the focus of the legislative package to be drafted by the Commission by the end of this year.

WHY IS THAT?

Finding the answer is simple; even if finding the eventual solution is not. Against the background of the overall decline in emissions since 1990, those due to Transport have risen 26% over the same period. They now comprise 19% of Europe's overall emissions. Transport seems therefore to have become increasingly relevant to EU climate policies, and the EEA indicated so in 2008, when it called for the Transport sector to apply "rigorous measures to help Europe meet its greenhouse gas emission targets".

AND THAT IS WHERE THE PROBLEMS BEGIN.

Increases in national economic activity and the globalisation of business inevitably lead to increases in disposable personal wealth and higher personal expectations. Together, these increase the demand for personal mobility, including air travel for both business and leisure purposes. They also foster broader shopping habits for food, such as fresh fruit out of season; and for other goods, including, of course, cars. Moving more goods and more people requires the provision of more transport, either directly of the people themselves, or indirectly by bringing the goods to the people.

And so we return to basic physics to provide part of the answer to the question posed in this article. Economic activity requires the movement of goods and people. Transporting them requires energy, and so can never by itself be truly "Green".

The rest of the answer depends how you examine the problem. Great strides have been made in reducing the fuel consumption of the car, so making it "greener", and the goal of 120g CO_2 per kilometre is an important step. But there are more cars on the road than ever before (16% more within E-15 between 1990-1999, according to Eurostat), while the benefit of increased efficiency of aero engines has been offset by the growth in air transport. Electric cars are "green" because they produce no emissions. Until you consider that the electricity must be generated somehow. Mass transport (such as a single train replacing many cars) is "green" (if the train is full) because it consumes less fuel and emits less CO_2 per passenger mile travelled. Unless you also consider the fuel consumed by the cars as they converge upon the mass transport systems.

Leinen summarizes these issues very well: "Despite its environmental impact and the recognition of the need to cut down on transport emissions, reducing them is not an easy task for policymakers".

While under Professor McGlade, the EEA document TERM 2009 calls for "a package of policy measures that does not rely solely upon technology", including measures whose impacts may be "so distant in time, we need a common vision for sustainable transport and mobility". Nevertheless, it has been observed that "The Stone Age did not end because we ran out of stones". It ended because a better technology emerged; and a new technology to replace our dependency on fossil fuels represents perhaps the most important single contribution to the resolution of the problems we face.

Climate change is obviously important to the future of mankind: and although M. Coriolis might not recognise the use of his term, there nevertheless remains much work to be done. And the clock is ticking.

CleanTech Leasing

Enabling Green Technologies Through Joint Venture Partnerships

Financing Sales Success

What will ultimately determine the success of the Electric Vehicle (EV) industry? Sales.

A great product and interested customers are not enough, the interested have to be converted into buyers in order for EV companies to grow and be successful. But herein lies the problem, despite demand being high, customers wishing to buy Cleantech products struggle to obtain finance to allow them to do so.

Any market offering high-value capital items depends on good financing deals to make its products affordable. Customers have always needed assistance from leasing to spread the cost of major purchases. But EV and other Cleantech industries, being young and unproven, are not seen as attractive prospects for most of the traditional UK asset finance companies.

These asset finance companies are by nature cautious. They are reluctant to get involved in markets where current sales are still low and demand may not meet forecasts. They also look for proven re-sale markets and re-sale values to cover themselves in the event of non-payment of leasing. Clearly for new products the second-hand market has yet to be established.

The answer, says Peter McDonald of SME Eurofinance, is for the EV manufacturers to partner with a finance company to create their own bespoke leasing product. One that they and their customers can have confidence in because they control the terms, and where they have a vested interest in the market success.

Tim Rogers was formerly the UK CEO of Nasdaq-listed Clean Diesel Technologies Inc. "Our product was in great demand from companies affected by the London Emission Zone Initiatives but we needed to be able to provide financing in order to secure sales. Many customers can't pay cash up front and need to be able to spread the cost of their purchases over time. It was while searching for a leasing product for Clean Diesel that I came across SME Eurofinance, and I knew at once that their joint venture product was just the kind of innovative solution that our market needs."

Since leaving Clean Diesel Tim has been working with SME Eurofinance to establish CleanTech Leasing, aiming to provide funding and leasing solutions through joint venture (JV) partnerships with CleanTech companies.

CleanTech Leasing
Enabling Green Technologies Through Joint Venture Partnerships

"We've looked at the CleanTech Market and can see that EV companies are well-advanced in terms of developing great products. There is a ready market of customers who understand the benefits and want to buy cleaner vehicles. The stumbling block that we see, and believe we can remove, is financing," explains Tim.

"The JV model overcomes the two big issues that traditional asset finance companies will cite as reasons not to get involved in Cleantech. Firstly there is a level of investment by the company themselves that spreads the risk. Secondly the manufacturer is taking responsibility for re-use and re-sale of any recovered assets."

"For EV companies wishing to offer their customer a leasing product a JV is a win-win solution," says Peter McDonald. "For a small up-front investment not only do they get to secure sales and a satisfied customer that they might not win otherwise, but they get to share in the profits of the JV and, ultimately, see their investment returned. Although third-party investment is required to set up each partnership company, the aim is that the JV should become self-sufficient, using the proceeds of the leasing agreements to fund future growth.

"This is a model that SME Eurofinance have developed and are using successfully in other industries, but which we see can have particular appeal for the newly emerging Cleantech markets who cannot readily find asset finance elsewhere. "

SME Eurofinance is an independent UK asset finance brokerage and lessor with 25 years experience and well-established relationships with investors. As the power behind CleanTech Leasing, they are able to provide full lease management that enables the new companies to get up and running very quickly. All the back office functions of underwriting, documentation, administration, billing and collecting are taken care of through the white label product, allowing each JV to have its own identity, bank account and contract terms.

"We believe we are offering a unique financing product that could really open up growth opportunities for the EV market," says Tim. "Having worked in the Cleantech industry I know how much untapped potential there is and how frustrating it can be to be sitting on products that have customer demand but no easy way of securing sales when cash is hard to come by. We're excited to be able to offer a solution to EV companies that we believe will get the market moving by enabling more sales to be made, provide a boost to the economy, and maybe even do some good for the future of the planet. It's a great feeling!" ●

Cleantech Leasing
4 Mulgrave Chambers
26-28 Mulgrave Road
Sutton
Surrey SM2 6LE

Contact name: Peter McDonald
pmcdonald@cleantechleasing.co.uk
Mobile: 07710 928 383

Contact name: Tim Rogers
trogers@cleantechleasing.co.uk
Mobile: 07799 862798

Electric Cars: How far, how fast?

Michael Edmund

The word electricity is derived from the Greek word electron, meaning amber, because static electricity was classically produced by rubbing lumps of it. And although fossilised tree sap has nothing to do with a modern electric car, it is electrons stored in the battery that are still responsible for its power. And electric car batteries may be on the point of a major advance.

There can be no doubting the importance of transport emissions, or of the potential role for electric cars in Europe's climate change equation. Many cities appear to be responding with an increasingly aggressive stance towards the conventional car, but although many mass-market manufacturers are planning to add hybrids or fully electric cars to their model ranges, the growth in the use of electric vehicles has been far from spectacular.

Two problems in particular have dogged the development of electric cars, and both of these concern the battery. They are the vehicle's range, which stubbornly remains around the 160 km (100 mile) mark; and the time required to recharge it. At an average speed of 80km/h, an electric car might require fully recharging after as little as two hours, a process which itself is

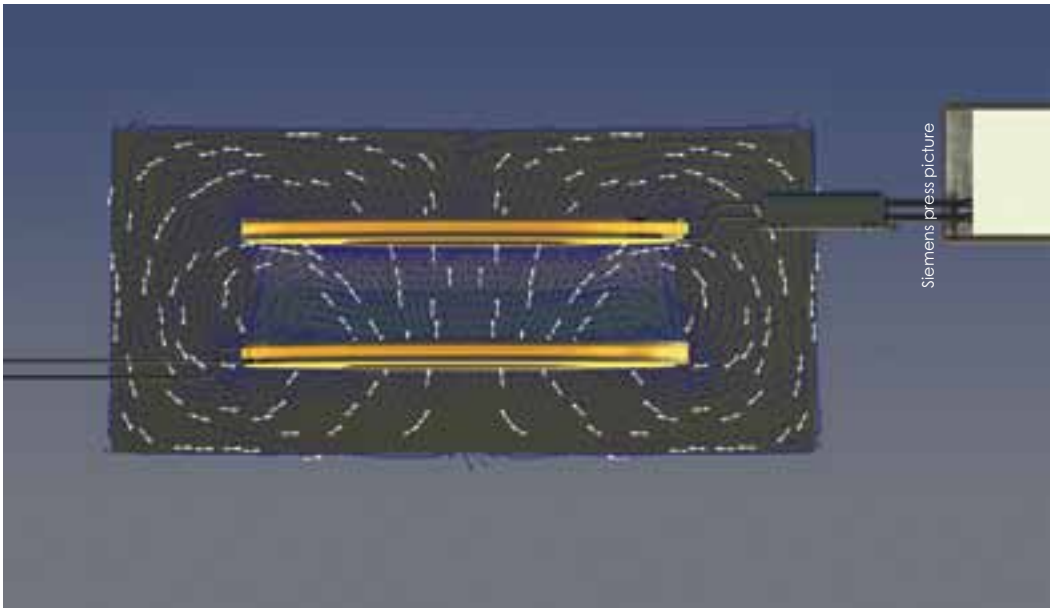
Soon, charging the batteries might be as convenient as a filling the tank

Siemens press picture

usually measured in hours, or even overnight when domestic circuits are involved. So there are drawbacks, although it should be said that electric proponents argue that short commuting distances within cities make such considerations irrelevant.

Now, two new technologies have emerged that may overcome many, if not all of the principal limitations of existing designs.

The first of these, a new battery, is based on nano-sized particles of the compound lithium titanate, and it has been claimed that the battery can be recharged in as little as 10 minutes. The technology is based upon the fact that, gram for gram, the surface area of the new lithium titanate anode is over thirty times greater than for a conventional one. At the nanoparticle level, this means that electrons can be moved much faster through the terminal into the battery, meaning much shorter recharging times. According to Toshiba, the new titanate compound is also very stable, with minimal degradation even after 6,000 or more charge-discharge cycles. This is important, because it means the need for battery replacement is reduced, along with the environmental impact of waste batteries. Though the sub-10 minute recharge time has yet to be demonstrated in real-life situations in commercially-available electric cars; and though it is clear that final performance ultimately depends upon the circuit used to charge the car, this new technology may nevertheless represent a significant leap forward. With an empty-to-full recharge time potentially the same as that of filling the fuel tank of a conventional car, one of the major drawbacks of electric cars may soon be overcome.



The contactless charging system that may revolutionise electric transport

Meanwhile, a second development, recently unveiled by Siemens at the Hannover Messe, offers a further step forward. It is wireless charging. A two-coil inductive charging system, with the primary coil buried beneath the road surface and the secondary coil on board the vehicle, allows a vehicle battery to be recharged without a cable, simply by parking in the right place. Although at an early stage of testing the prototype, such a system offers the prospect of much greater flexibility in the location of recharging points. It also raises the intriguing prospect that electric cars might one day become temporary storage devices, used to smooth out excess power generation by unpredictable renewable sources such as sunlight and wind.

We have come a long way since the days of static electricity experiments with amber. Acceptance of the electric car has nevertheless been slow, and it seems that it still has a little way to go before it can go a long way. ●

BioEng: The Nordic top-level research initiative project

Focus on production of second-generation bio-fuels and its influence on engine combustion and emissions.

'BioEng' is a newly founded Nordic research network funded by the Top-level Research Initiative, a joint Nordic research and innovation initiative from the Nordic Research Councils. The topic for the project is the efficient and viable use of second-generation bio-fuels in modern vehicles.

The international incentive for introducing bio-fuels into the ever expanding transport sector is obvious from political initiatives such as EU's "Directive on Promotion of the use of bio-fuels and other renewable fuels for Transport" from 2003, or "The Renewable Transport Fuel Obligation" in the UK from 2005.

However, the concern around political, economical and social issues related to first-generation bio-fuel production from food-stocks has caused delays in implementing the directives and political obligations mentioned above.

Nonetheless, the need to overcome these problems results in a strong international focus on developing sustainable production and utilization routes for second-generation bio-fuels. This is a global effort, and much investment is devoted to research and development activities both within academia and the industrial/public sector in this area.

Second-generation bio-fuels hold great scope as they will significantly reduce competition with food producing agricultural and improve greenhouse gas emission (GHG) reductions and well-to-wheel energy efficiency.

Bio-fuels produced via gasification of the energy source, followed by a synthesis process to the desired chemical composition, are part of the syngas chemistry, which offers high flexibility both regarding energy source and end product. This flexibility offers the possibility to decouple the bio-source from food agriculture and to focus on plants or bio-waste with high yields, but also the possibility to use fossil source when suitable, e.g. "stranded" natural gas. The conversion process itself can bring a comparatively big part of the source energy into several possible end products, of which three are the focus fuels in the experimental part of the project – Dimethyl ether (DME), Fischer-Tropsh diesel and methanol.

These fuels are believed to be alternatives for blends for ultra clean fuels for diesel and gasoline engines. However, differences in viscosity (low for DME, high for transesterificated biodiesel), high cetane numbers and specific densities complicate the use of such fuels in real internal combustion (IC) engines. These technological challenges have given the focus to this project, where experimental and simulation work will advance our knowledge on specific frontiers. In parallel, a well-to-wheel study will further deepen our understanding of the overall perspective of bio-fuels and potentially lead to adjustments of present focus.

The project partners consist of key academic actors such as the Norwegian University of Science and Technology (NTNU) and the Technical University of Denmark (DTU), and industrial partners Volvo Powertrain AB, Saab Automobile Powertrain AB, Lund Combustion Engineering LOGE, Chemrec AB and Ford Forschungszentrum.

NTNU
Faculty of Engineering Science and Technology
Department of Energy and Process Engineering

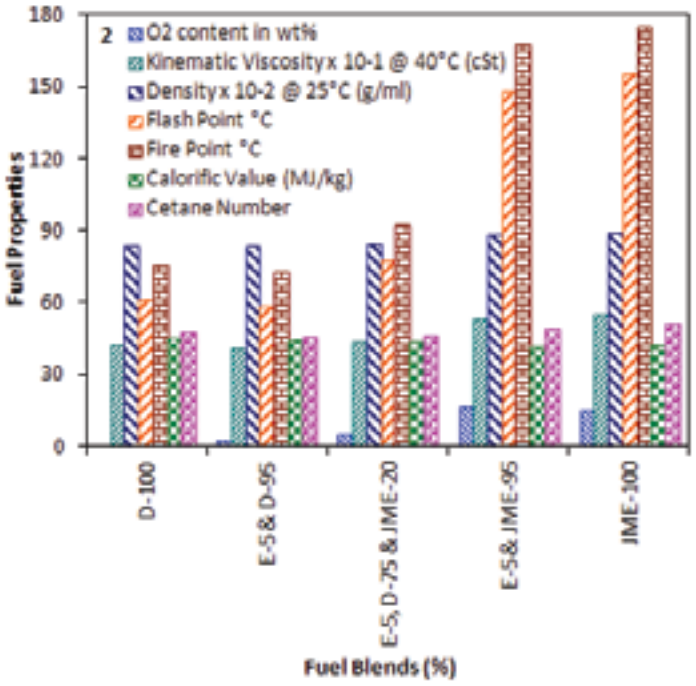
The project intends to systematically investigate the performance of second-generation bio-fuels in modern diesel and petrol engines. Experimental and numerical test facilities are under the development for parallel studies of different bio-fuels in various state-of-the-art engines provided by the industrial partners. This enables a direct comparative study of the obtained results in three important aspects: engine combustion, performance and emissions. Differences between properties of conventional petroleum fuels and bio-fuels significantly affect these critical areas associated with usage in practical applications (car, heavy duty, and industrial engines).

Compared to mature areas of technology, the performance parameters for bio-based fuels have a very wide span, which is partly explained by the transient nature of a young technology sector. Hence, research conducted so far regarding realistic applications is inconclusive. This project focuses on some of the high performing bio-based transport fuels, and deepens our understanding of the relative merits of these fuel value chains, between which we could expect that the actual competition will take place, as the market gets more mature.

For example, regarding the DME combustion system development, very little work globally has been done on small car sized engines, and no published work has been done on Euro6 emission level. The project aims to demonstrate a Euro6 diesel process concept based on EGR and with oxidation catalyst only as exhaust after treatment. Such a concept would demonstrate an extremely competitive combination of cost, efficiency and emission performance.

Furthermore, the experimental tasks with low level methanol blends in flexi-fuel car and the impact of F-T diesel fuel versus present European quality updates available data to state of the art engine technology, and give correct input to the further analysis.

However, most importantly the project covers systematically and comprehensively comparative investigations of various fuels for the full range of engine operating parameters, performance indicators, and all the key pollutants from engine exhaust. This will guide manufacturers when designing the future optimized engines needed to meet the stringent requirements which are soon to become reality when the bio-fuel market has established itself as part of the commercial fuel market. ●



Typical characteristics of diesel (D), ethanol (E) and Jatropha Methyl ester (JME), either as pure fuels or blends. The differences e.g. in viscosity due to increased levels of biofuels are the cause of concern when employing such fuels in conventional engines. However, other characteristics affect combustion efficiency and emission levels and are the subject for systematic investigations.

Prof. Terese Løvås
Department of Energy and Process Engineering
Kolbjørn Hejes vei 1a
7491 Trondheim
Norway
Phone: +47 735 93709
Mobile: +47 9189 7007

Ref.: Kannan et al. , SAE Paper No. 2009-01-1808, (2009)

Biofuels are flying the skies

Kyriakos Maniatis, Principal Administrator, European Commission, DG ENER

Stefan Tostmann, Head of Unit, European Commission, DG MOVE/DG ENER Resources

THE EU AVIATION SECTOR

Aviation is one of the strongest growing transport sectors. In the period up to 2050, worldwide aviation is expected to grow by 4.5% annually. If fuel consumption and CO2 emis¬sions were to grow at the same rate, CO2 emissions by worldwide aviation in 2050 would be nearly six times their current figure.

Historically, significant fuel efficiency gains have been achieved by operational improvements (e.g. higher load factors, utilization of larger aircraft) and by technical progress (e.g. more efficient engines, lighter airframes). This is expected to continue. As a consequence, aviation fuel consumption is forecast to grow only by 3% annually. Even this, however, implies a more than tripling of CO2 emissions by 2050. For the EU, aviation traffic expected to grow at an average rate of 3% annually until 2050, implying fuel consumption growth of 2% annually, and hence a more than doubling of CO2 emissions by 2050.

The current worldwide consumption of aviation is about 200 million tonnes kero¬sene per annum. European consumption was 53 million tonnes in 2010. Total annual con¬sump¬tion of the largest European airlines (Lufthansa group, AF/KLM group and BA) is about 20 million tonnes.

A critical change will come into play in 2012 when aviation will be included to the EU Emission Trading System , . Allowances for the aviation sector are determined as a percentage of 2005 emissions. A proportion of these allowances will be allocated to airlines based on their individual activity in 2010. The shortfall will be met by purchasing allowances through auctions and carbon markets. This system covers both EU and Non-EU carriers.

THE POLICY CONTEXT

The Renewable Energy Directive (RED) set a target that 10% of all energy in the transport sector must come from renewable energy sources and the European Union also adopted sustainability criteria for biofuels to be counted towards that target. Only those biofuels complying with the sustainability criteria set by the RED can qualify for the targets and incentives by the Member States.

The Renewable Energy Directive applies also to biofuels used in aviation, including international aviation when sold in a Member State. Biofuels used in aviation thus count towards meeting the RED target if they comply with the sustainability criteria.

TECHNOLOGY

The European Industrial Bioenergy Initiative was launched on 16 November 2010 in the SET-Plan conference

in Brussels. The initiative is characterised by very innovative technologies and high-risk investments in comparison to all other renewable energy industrial initiatives which aim to improve existing technologies that already have a place in the market and to further facilitate their penetration. The EIBI, on the other hand, aims to bring new technologies onto the market for the first time. The focus of the value chains is on second-generation biofuels production from lignocellulosic biomass, advanced CHP technologies and novel concepts of producing biomass intermediate products.

The EIBI is based on seven value chains, which are summarised in Table 1. In addition to the seven value chains, two horizontal actions are also addressed that are critical for a successful deployment of bioenergy technologies in the EU market. These address the resource availability in the EU and beyond, as well as social acceptance.

Among the different qualities of biofuels, at present three types are favoured to be used in aviation jet engines blended with kerosene: Synthetic Fischer-Tropsch (FT) based kerosene produced through high temperature biomass gasification, Hydrogenated Vegetable Oils (HVO) and Hydrogenated Pyrolysis Oils (HPO) produced from lignocellulosic biomass. The figure below, produced by Airbus, shows the main options for alternative biofuels in aviation and compares the status of the biofuels to that of fuels form fossil origin.

Source Airbus

Table 1: EIBI Bioenergy Value Chains and Horizontal Actions[7]

GENERIC VALUE-CHAINS
Thermochemical pathways (TP)
1: Synthetic liquid fuels and/or hydrocarbons (e.g. petrol, naphtha, kerosene or diesel fuel) through gasification.
2: Bio-methane and other bio-synthetic gaseous fuels through gasification.
3: High efficiency heat & power generation through thermochemical conversion
4: Intermediate bioenergy carriers through techniques such as pyrolysis and torrefaction
Biochemical pathways (BP)
5: Ethanol and higher alcohols from lignocellulosic feedstock through chemical and biological processes
6: Hydrocarbons (e.g. diesel and jet fuel) through biological and/or chemical synthesis from biomass containing carbohydrates
7: Bioenergy carriers produced by microorganisms (algae, bacteria) from CO2 and sunlight
Horizontal actions (HA)
8: Resource availability and spatial planning
9: Public acceptance

FT kerosene is produced via lignocellulosic biomass gasification followed by gas cleaning and synthesis over appropriate catalysts and already today is approved for a 50% blend by ASTM (see section on Safety and Standards above).

HVO is based on triglicerides and fatty acids which can originate from plant oils, algae and microbial oil. Hydrogen demand for hydrogenation of different feedstock qualities varies, resulting in conversion cost advantages for certain

Table 2: EC-Funded Large-Scale Demonstration Projects under FP7

EC Biofuel Cluster	Contract Acronym	Coordinator	Contract Technology Provider	Biofuel	EC Support		
€ M	Biomass	Production Capacity					
Synthetic	OPTFUEL	VW	Choren Industries	Fischer-Tropsch	7.8	Wood	15,000 t/y
	BIO DME	Volvo	Chemrec	Dimethyl-ether	8.2	Black Liquor	600 t/y -150 days operation)
LG EtOH	BIOLYFE	Chetex Italia	Chetex Italia	Ethanol	8.6	Various	40,000 t/y
	FIBREEtOH	UPM	UPM	Ethanol	8.6	Fibre	20,000 t/y
	KACELLE	Dong Energy	Inbicon	Ethanol	9.1	Straw	20,000 t/y
	LED	Abengoa	Abengoa	Ethanol	8.6	Corn resd.	50,000 t/y
Pyrolysis	EMPYRO	BTG	BTG	Bio-oil	5.0	Wood	17,400 t/y
Algae	ALL-GAS	Aqualia	Feyecon	Biodiesel & biomethane	7.1	Algae	90t/ha.y algae
	BIOFAT	Abengoa	Alga Fuel	Biodiesel & ethanol	7.1	Algae	90t/ha.y algae
	INTESUSAL	Centre of Process Innovation	Centre of Process Innovation	Biodiesel	5.0	Algae	90t/ha.y algae
Total					**75.1**		

raw materials like palm oil and animal fats. In absence of technical restraints, market forces and legislation are the main forces for oil and fat selection.

HPO kerosene is based on pyrolysis oils from lignocellulosic biomass. Pyrolysis oils can be hydrotreated either in dedicated facilities or co-processed with petroleum oils in refineries. Today pyrolysis oil is at the edge of research towards demonstration level.

Algal oils can also replace vegetable oils in HVO or similar processes but these will not be commercially available at least within the next 5-8 years. Due to very high infrastructure cost for industrial algal cultivation it is unclear when competitiveness vs. conventional plant oil or other advanced biofuels cost will be achieved. However, due to the fact that in principle there are no issues related to land use, algal oils have attracted significant interest by the aviation sector.

Direct conversion of sugars to hydrocarbon fuels is a new approach that has gained considerable interest recently in developing technologies to convert sugars to hydrocarbons. However, these technologies still have to be demonstrated although progress is considered to be rapid.

All the above types of biofuels are amongst the value chains prioritised by the EIBI. Most of them have been supported by the EC under 7th EU Framework Programme (FP7). Since the start of FP7 in the area of bioenergy, the calls have prioritised large scale demonstration projects with particular emphasis on biofuel production from lignocellulosic biomass and have addressed the most important value chains described in Table 1 below. This has resulted in 10 large-scale demonstration projects that are led by strong industrial consortia aiming to accelerate technology development in key areas and to facilitate their market deployment. The 10 contracts can be divided into four main clusters that represent particular value chains, as shown in Table 2: synthetic biofuels, lignocellulosic ethanol, pyrolysis, and biofuels from algae .

STANDARDS

Certification of commercial aviation kerosene is co-ordinated among the US based ASTM and the UK DEF STAN organisation for Europe. In the case of aviation biofuels, the two bodies have agreed that the certification is co-ordinated by ASTM. ASTM has developed standard ASTM D 7566 to specify ASTM D 1655 kero¬senes produced from other material than crude oil. ASTM D 7566 current¬ly covers Fischer Tropsch fuels in its annex A1. DEF STAN is mirroring this in Annex D of DEF STAN 91-91 Issue 7, by referring to ASTM D 7566. A second annex covering HVO fuels is in the final stages of ASTM approval. Official publication of the specification is currently expected in early August 2011.

As part of the ASTM International fuel approval procedure, intensive tests have been conducted both by the airframe and the engine manufacturers. Some demonstration flights have also been conducted and confirmed that the tested biofuels and blends are "fit for purpose" .

THE BIOFUELS FLIGHTPATH

On 22 June 2011 during the International Airshow at le Bourget, Paris, The European Commission's services, in close coordination with Airbus, leading European airlines (Lufthansa, Air France/KLM, & British Airways) and key European biofuel producers (Choren Industries, Neste Oil, Biomass Technology Group and UOP), launched the Biofuels FlightPath which aims to achieve 2 million tons per year of biofuels use in aviation by 2020. This exciting new industry wide initiative aims to speed up the commercialisation of aviation biofuels in Europe.

ACKNOWLEDGMENTS

The Biofuels FlightPath was developed by a core team consisting or representatives from Airbus, Lufthansa, Air France/KLM, British Airways, Choren Industries, Neste Oil, Biomass Technology Group, UOP and the European Commission.

Notes:

[1] These figures are based on data presented by Booz & Company at the 2011 World Economic Forum in Davos.

[2] SWAFEA (http://www.swafea.eu/) estimate

[3] The EU Emissions Trading System (EU ETS) is a cornerstone of the European Union's policy to combat climate change and its key tool for reducing industrial greenhouse gas emissions cost-effectively. Being the first and biggest international scheme for the trading of greenhouse gas emission allowances, the EU ETS covers some 11,000 power stations and industrial plants in 30 countries. See: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2003L0087:20090625:EN:PDF

[4] See: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:008:0003:0021:EN:PDF

[5] Directive 2009/28/EC of the European Parliament and of the Council of 23/04/2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, Article 17 Sustainability criteria for biofuels and bioliquids, at pp. L140/36-L140/38.

[6] For an overview of the European Industrial Initiatives, see the Commission website: European Commission, "SET-Plan, towards a low-carbon future", available on the Internet <http://ec.europa.eu/energy/technology/set_plan/doc/setplan_brochure.pdf,

[7] See SEC(2009)1295, "A Technology Roadmap", at pp. 30-34.

[8] For a summary of the ethanol cluster FP7 projects see "Background" in: http://ec.europa.eu/dgs/energy/newsletter/dg/2010/0520newsletter.html

[9] For a summary of the algae cluster FP7 projects see: L. Hobson et al, "Algal Biofuel Developments in the EU", Fuel, Hart Energy, pp 36-41, March 2011

[10] For a summary of the EC funded projects see Kyriakos Maniatis, "European Union policy measures and support for the promotion of next generation and advanced biofuels" in World Biofuels Markets, Amsterdam 15-17 March 2010, and "The European Industrial Bioenergy Initiative of the EU SET Plan", in Pulp and Paper 2010, Helsinki, 1-3 June

[11] "Powering the future of flight", Air Transport Action Group, March 2011, see: http://www.atag.org/files/Powering-141456A.pdf

[12] http://ec.europa.eu/energy/technology/initiatives/biofuels_flight_path_en.htm

SCK•CEN, the Belgian Nuclear Research Centre

SCK•CEN, with laboratories in Mol and a registered office in Brussels, is one of the largest research centres in Belgium. More than 650 people work on the development of peaceful industrial and medical applications of nuclear science and ionizing radiation.

BUILDING ON ALMOST 60 YEARS OF EXPERIENCE IN NUCLEAR SCIENCE AND TECHNOLOGY

Since its foundation in 1952, the Belgian Nuclear Research Centre has been playing a pioneering role with unique achievements and groundbreaking work in the area of nuclear science and technology.

FUNDAMENTAL AND APPLIED RESEARCH

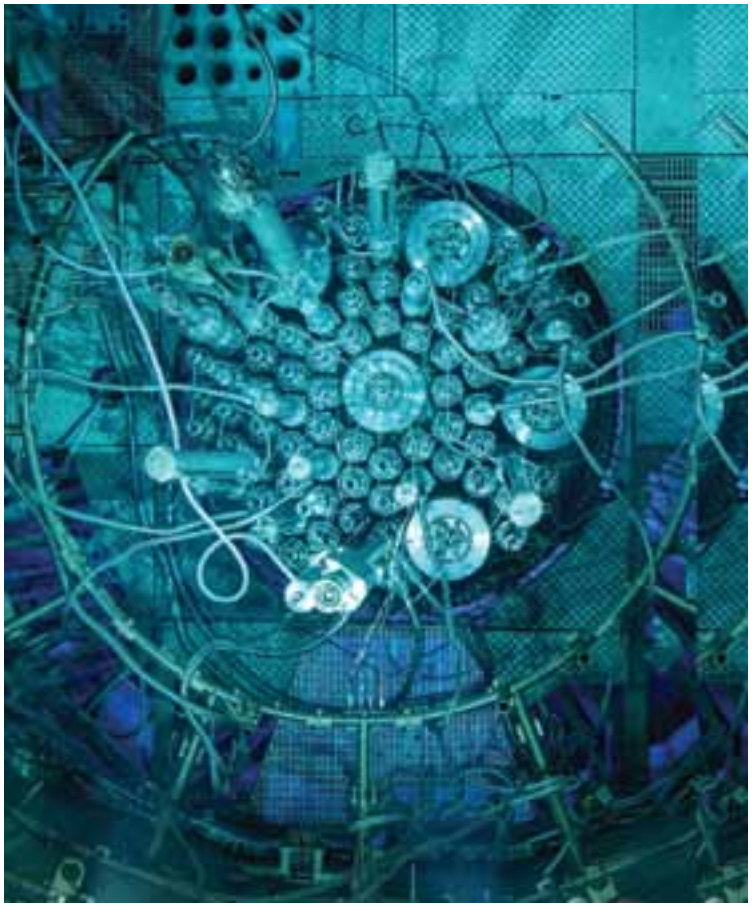
SCK•CEN conducts fundamental and applied research at an advanced scientific level and in an international context. Our core activity is to work on nuclear issues that are important to society today and tomorrow. In this way we help improve the safety and efficiency of nuclear installations, we find solutions for the sustainable disposal of radioactive waste and have developed techniques for the decommissioning of nuclear plants. The protection of mankind and the environment against ionizing radiation is another extensive field of research.

SCK•CEN AT YOUR SERVICE

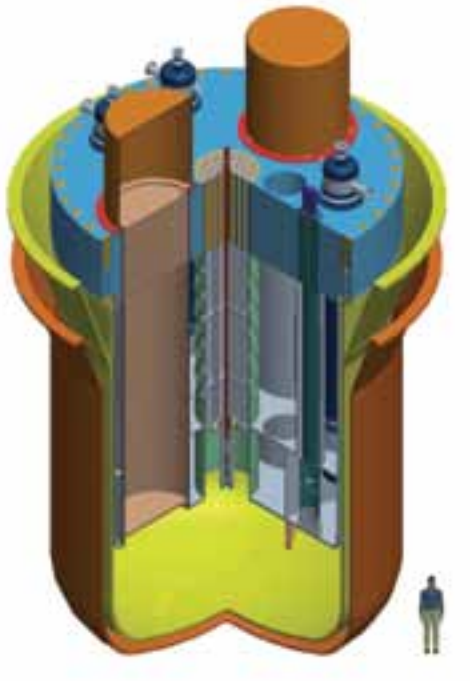
With our specific expertise and unique research facilities, we offer various services to government, nuclear and non-nuclear industry, the scientific community and the medical sector, both nationally and internationally. SCK•CEN, a meeting point of knowledge and practice, is also an excellent training centre. The courses cover all our research fields and modular programmes can be tailored to the needs of the target audience.

THREE SCIENTIFIC INSTITUTES

SCK•CEN's three scientific institutes each study a specific domain of nuclear applications. Research is made possible



Top view of Belgian Reactor 2, a research reactor with multiple applications.



Design of MYRRHA, a flexible fast spectrum research reactor, conceived as an accelerator driven system.

through the on-site availability of high performance nuclear research reactors, well-equipped nuclear and non-nuclear laboratories, including an underground research facility, which is operated jointly by SCK•CEN and ONDRAF/NIRAS.

The Institute for Environment, Health and Safety (EHS) studies the behaviour of radioactive substances in air, water and soil and evaluates the effects of radiation on mankind and the environment. Based on this knowledge, EHS provides expertise for authorities, industry and the medical sector. EHS also pays attention to the societal and ethical aspects of nuclear technologies such as sustainable development, safety and safeguards.

The Institute for Advanced Nuclear Systems (ANS) strives to extend the Belgian expertise in the study of innovative fourth-generation reactors and the development of nuclear fusion technology. These innovative installations will be safer and more efficient. With MYRRHA, ANS develops a multifunctional experimental irradiation facility for the production of radioisotopes, the transmutation of radioactive waste and the training of scientists and engineers.

The Institute for Nuclear Materials Science (NMS) carries out research on materials and fuels used in present and future reactor systems. This analysis is essential to guarantee their safe and efficient operation. NMS also produces radioisotopes for the medical sector and doped silicon for micro-electronics in renewable energy applications.

RESEARCH TOWARDS A SUSTAINABLE OPTION

Our motto 'Research towards a sustainable option' summarizes our mission entirely. Global energy issues, safety of nuclear installations and innovative technologies: SCK•CEN does it all with sustainability in mind. In this way we contribute to a viable society, for ourselves and for generations to come. ●

www.sckcen.be
info@sckcen.be

Operational Office
SCK•CEN
Boeretang 200
BE-2400 MOL
Belgium
Tel. +32 14 33 21 11
Fax +32 14 31 50 21

Registered Office
SCK•CEN
Av. Herrmann-Debrouxlaan 40
BE-1160 BRUSSELS
Belgium
Tel. +32 2 661 19 51
Fax +32 2 661 19 58

Successful EU Project showcases the power of collaborative R&D in creating new solutions, new ways of bringing offshore renewable energy to market

Máire Geoghegan-Quinn, European Commissioner for RTD and Innovation, visited the project fitting-out site at Galway (Ireland) in February 2011, just before the floating test platform was towed out to sea. On the photo the Commissioner is discussing with great interest the progress of work with Prof. Tony Lewis, the project director.

The project CORES: "New Components and concepts for ocean energy convertors" is being completed in September 2011 after running for 42 months under the 7th Framework Programme.

The work was done by 13 partners in 7 countries and led by the Hydraulics and Maritime Research centre (HMRC) at University College Cork in Ireland. The overall budget was 4.2 M€with 3.5M€in EU support.

CORES has developed new power take-off, control, and mooring systems as well as risers, data acquisition and instrumentation solutions for floating energy converters. All were sea tested on a specially developed floating test platform anchored off Galway in West Ireland. The components are applicable to a variety of resources and devices.

The Project Director, Professor Tony Lewis of HMRC, says the

CORES

The CORES testing platform at sea showing the newly developed turbine on deck. During the months at sea, the project team kept continuously in contact with the unmanned device for monitoring and controlling the tests using wireless communication. The picture is a screenshot from video transmitted live from the testing platform to the project team's smartphones.

results are very encouraging.

Recently a Contributing Lead Author of the UN IPCC Special Report on Renewable Energy, Lewis considers that not only Ireland but much of Europe's Atlantic coastline has incredible potential for wave power generation: "If Ireland and Europe capture this opportunity, we have the potential to create a substantial number of jobs, solve our energy problems, and be world leaders in this new energy field".

Moreover, the way CORES was successfully completed, on budget, by small decentral teams with a lean but strong central leadership, shows a new way forward to achieve results in the sector under the current financially strained regime, making optimal use of public support.

The CORES project will have a big positive impact in reducing technical as well as non-technical risks in the marine environment and towards reducing the cost of clean electricity produced from the world's largest remaining unexploited renewable energy resource.

CORES will be extensively presented at the European Wave & Tidal Energy Conference and Exhibition (EWTEC) in Southampton, UK in September 2011. A Special Workshop has been scheduled arranged on Tuesday 6th September and an Exhibition will feature among others the actual turbine used in the sea tests. In addition, several technical papers presenting new advances have been accepted for the ordinary scientific program.

Your Brussels partner for energy innovation

1-Tech is a research-based small company with its own, independent expertise covering a wide range of energy and “clean” technologies and applications. The company is specialised in facilitating innovative solutions, projects and business ventures.

1-Tech works with creative people in organisations who are interested in European and international programmes and funding. Together, we help find the right programme for your innovative ideas, and with developing ideas and concepts to fit a specific context.

This *project design* is our core activity. In the process, we work closely with the Consortium team to align its interest with the strategic objectives and impacts of the particular Programme, Call and Topic being addressed. Thereby, 1-Tech’s contribution adds value not only for our clients, but also for the public funding programme in question by delivering higher-quality, better-targeted projects.

1-Tech also supports customers in the management of ongoing projects, whether EU funded or not, and take on expert advisory work for companies striving to commercialise R&D results and protect the IPR generated.

Our commercial business is funded by private contracts with companies, R&D institutions and public bodies from all over Europe, as well as a few overseas. Occasionally, 1-Tech will join EU project consortia as a beneficiary with a small but carefully defined role, e.g. where an emerging technology offers particular strategic benefits, and where our expertise can be applied also in the execution phase.

This has been the case for three recently awarded R&D projects in the new field of combined off-shore renewable energy: *MARINA Platform, HiPRWind* and *MaRINet*. See www.marina-platform.info, www.hyperwind.eu and (soon) www.marinet.eu for info on these exciting pan-European projects which represent efforts of more than 40 million €.

Head Office: 1-Tech s.p.r.l.
Rue du Luxembourg 23, B-1000 Brussels
+32.2.280.1284 – http://www.1-tech.eu
Executive Director: Dr. Jan Erik Hanssen
+32 474.980.616 – hanssen@1-tech.net
Company reg.: BE 456.682.433 (est. 1995)

News

Arctic Ice Sheets: situation not quite critical?

The arctic ice sheet has become an important marker of the effects of climate change. In recent years, scientists have advanced the concept of a “tipping point”, arguing that the ice cap, which is relatively white, reflects more solar energy than the relatively dark sea, which absorbs more energy; and so loss of ice could become a significant factor accelerating further loss. However, recent Danish work has shown that for about 3,000 years, during a period called the Holocene Climate Optimum, there was more open water and far less ice than today - probably less than 50% of the minimum Arctic sea ice recorded in 2007. Dr Funder of the Natural History Museum of Denmark, comments “I don’t say that our current worries are not justified, but I think that there are factors which will work to delay the action in relation to some of the models that have been in the media”.

Picture: Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany

Fukushima: Out of Disaster, Progress

The devastation wrought upon Japan by this year's earthquake and tsunami has had important consequences across the globe. One of these was the German review of its nuclear power programme, which led to the decision to phase out its nuclear power programme by 2022. Before March, almost a quarter of Germany's electricity was derived from Nuclear Power, despite the history of public opposition to it.

Under the German plan, the country's seven oldest reactors – which were taken offline immediately after the Japanese crisis – will never be used again, while an eighth plant, which has had many technical problems, will also be shut down.

Six more plants will go offline by 2021, followed by the last three a year later. Already a world leader in photovoltaic energy, Germany seems poised to become a leader among industrialised nations in the switch to renewable energy.

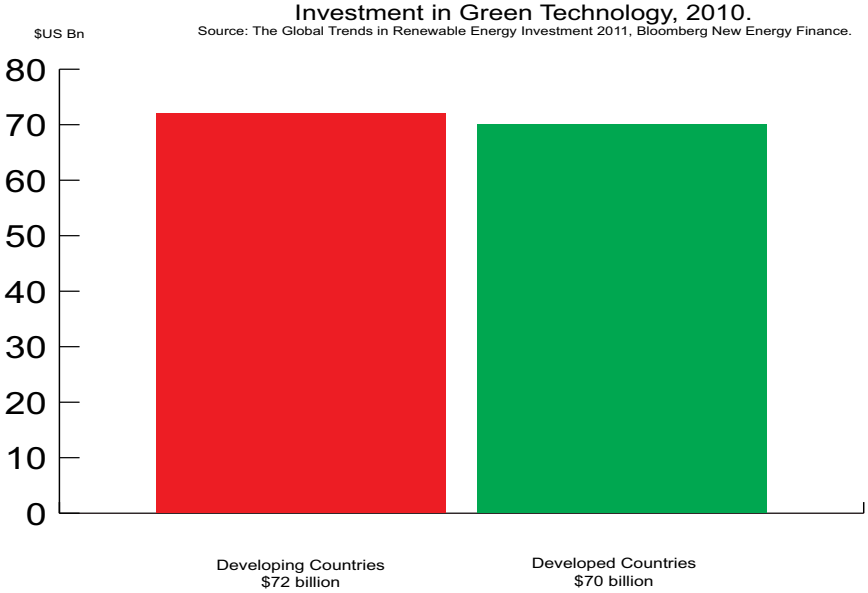
Green Energy News

Global investment in renewable energy sources has grown by 32% during 2010 to reach a record level of US$211bn (£132bn), according to a UN study.

Growth was mainly driven by investment in wind farms in China, and rooftop solar panels in Europe, while developing nations invested more in green power than rich nations for the first time.

"The combination of government target-setting, policy support and stimulus funding is underpinning the renewable industry's rise and bringing the much needed transformation of our global energy system within reach," said Achim Steiner, executive director of the UN Environment Programme.

Investment in Green Technology, 2010.
Source: The Global Trends in Renewable Energy Investment 2011, Bloomberg New Energy Finance.



From toilet to tank: the saga of the world's first sewage-powered fueling station

Author: Cheryl Kaften, TMCnet contributor

The world's first sewage-powered hydrogen fueling station is now open to drivers of hydrogen-powered cars at Exit 405 off the Freeway at Euclid Avenue in Orange County, California. The converted waste offers the equivalent of 70 miles per gallon. (1 US gallon is approximately 3.75 litres - Editor)

The fueling station is actually on the premises of the Orange County Sanitation District's wastewater treatment plant. Biogas from the sanitation facility is being used as the as the key component of a new fuel cell. The fuel cell comprises a combined heat, hydrogen, and power system that co-produces hydrogen in addition to electricity and heat – making it a tri-generation platform.

The tri-generation platform is integrated with a hydrogen purification system to recover about 100 kilograms (kg) of hydrogen per day. Only the hydrogen is sent to the public fueling center, which can support between 25 and 50 fuel cell electric vehicle fill-ups per day. The fuel cell also produces approximately 250 kW of power for use by the wastewater treatment plant.

"Innovations like this demonstrate how targeted investment can accelerate breakthroughs in the hydrogen and fuel cell industry while driving the clean energy economy forward," said DOE's Deputy Assistant Secretary for Renewable Energy Steve Chalk. "By providing the added value of electricity and heat, this approach provides a significant step in overcoming economic challenges with hydrogen refueling infrastructure."

According to National Fuel Cell Research Center Director Scott Samuelsen, "This is the epitome of sustainability. We're taking an endless stream of human waste and transforming it to transportation fuel and electricity. This is the first time this has ever been done."

The project was developed as a partnership between the U.S. Department of Energy, California Air Resources Board (News - Alert), the Orange County Sanitation District, and private industry. The project is managed by Air Products and additional partners include FuelCell Energy, Inc. and the National Fuel Cell Research Center at the University of California, Irvine.

In an official statement, the U.S. Department of Energy commented, "The … fuel cell system could offer a pathway to low-cost hydrogen and also demonstrates the versatility of fuel cells to utilize multiple feedstocks, such as biogas and natural gas, to produce power and renewable hydrogen that can be used to fuel light duty vehicles such as forklifts or as backup power in applications such as cell phone towers."

The new fueling station runs primarily on biogas, but the system can also use natural gas to sustain a consistent feedstock in the case of any disruption in biogas availability or quality.

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