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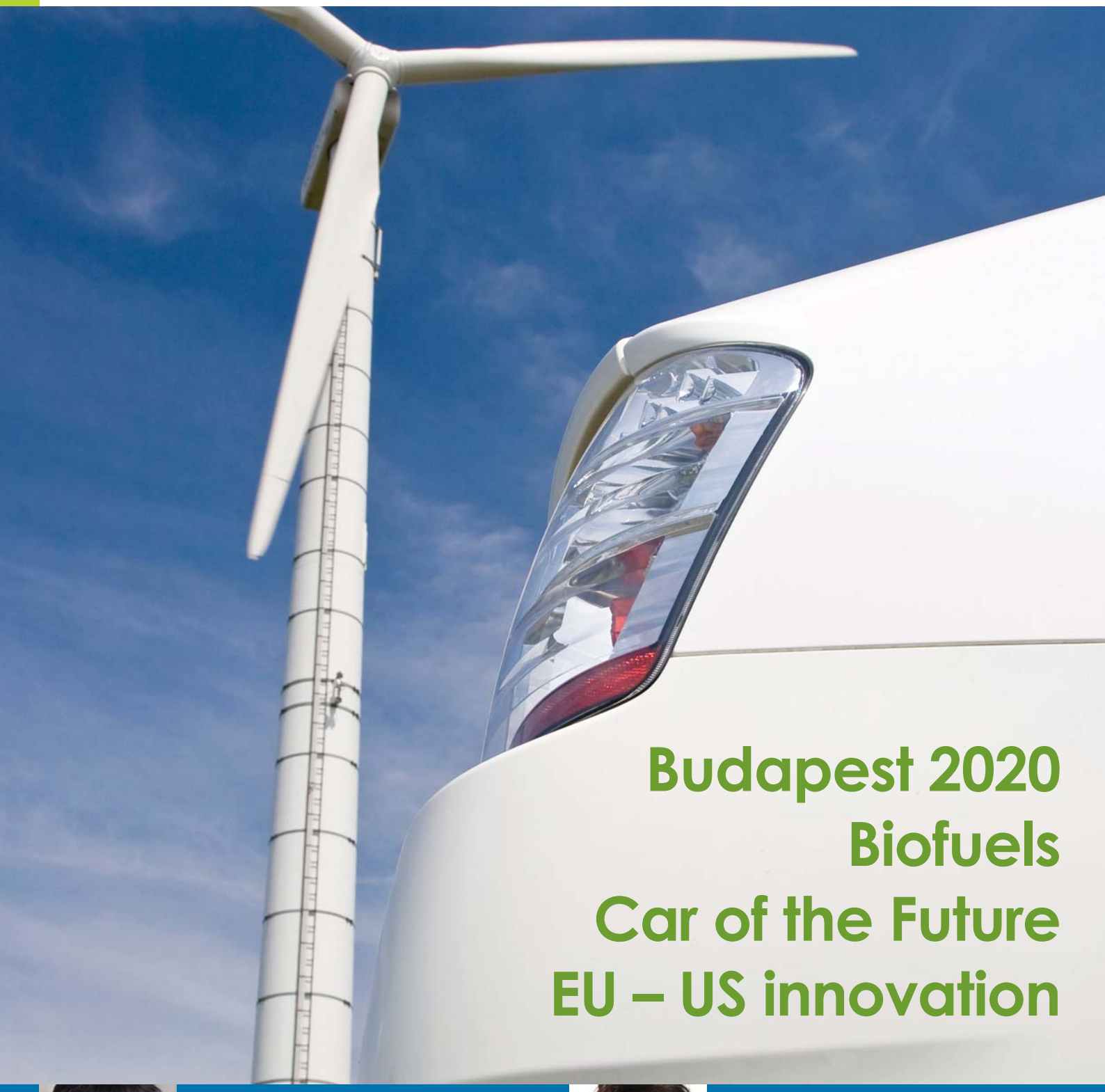

Budapest 2020
Biofuels
Car of the Future
EU – US innovation

Tamás Fellegi
Hungarian Minister for National Development

Edit Herczog, MEP
EU Energy Roadmap 2050

RENEXPO®
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5-7 May 2011 ■ Budapest, Hungary

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The **RENEXPO® Central Europe** 2011 will take place in Budapest, from the 5th to the 7th of May. In this year - **during the time of the Hungarian EU presidency** - the RENEXPO® will be the central energy platform for the central and eastern European region as **part of the official EU-program.**

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- Biogas Technology in Hungary and in Europe 5 May 2011
- International Geothermal Workshop - Geothermal markets in the Pannonian basin 6 May 2011
- International Conference on Municipal Energy Efficiency and the Use of Renewables organised by the Regional Environmental Center 6 May 2011
- Sustainable Energy for EU Crisis Management Operation organised by European Defence Agency 5-6 May 2011

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Foreword

As Europe emerges blinking into the welcome sunlight of spring, there are signs of growing tensions among the various stakeholders involved in energy innovation. Hungary holds the current Presidency of the European Union, and as the interview with the Minister for National Development Tamás Fellegi makes clear, the country is taking seriously its commitment to increase the ratio of renewable energy sources to 13% by 2020.

And as the piece by Hungarian MEP Edit Herczog (who is also a member of the European Parliament ITRE Committee) stresses, maintaining investment in the energy sector is vital. These investments need to be promoted now, she believes, even with the handicap of the present economic crisis, if Europe is to come close to achieving its 2020 targets.

Some are looking further ahead. The reputable Centre for Alternative Technology in Wales maintains that for the UK, a 100% reduction in carbon emissions is feasible by 2030. While its report "Zero Carbon Britain 2030" focuses on one country only, the organisation's point that a common sense of purpose is necessary if such challenging targets are to be met, is valid for most societies around the world.

Many think that the commitments made by EU member states to reach such targets should be binding. Chris Davies MEP for example, spokesman for the ALDE group in the European Parliament, commented on recent European Commission proposals on energy efficiency and reducing greenhouse gas emissions by saying, "With fuel prices rising and set to stay high, energy efficiency targets should be made legally binding now. Not to insist upon this amounts to a betrayal of Europe's interests."

Others see certain EU targets as unrealistic and beyond the bounds of possibility. Research from the Eindhoven University of Technology (TU/e), as outlined in another article in this issue, suggests that there is simply not enough biomass available in Europe to make EU biofuel targets achievable.

Yet industry seems mostly to be happy with the European Commission's roadmap to greater energy efficiency. Latest announcements from major energy producers at time of going to press indicate that they are on the whole satisfied with current proposals, and ready to advance to a 25% target by 2020 should the emissions-trading scheme and support for renewables continue to be favourable.

Elsewhere in this issue, US Ambassador to the European Union William E Kennard asks whether it is top-down policies from government or bottom-up actions from the stakeholders themselves that drive successful innovation. He stresses the importance of the "innovation ecosystem", where government policy works hand-in-hand with the private sector to promote a holistic approach to innovation.

The topic of smart metering is dealt with in some detail in two separate articles, and in a quick look at the automotive sector, we outline how the much-criticised internal-combustion engine has kept pace over the years with tightening regulatory requirements, and the major hydrogen-fuel trial being undertaken by one global auto manufacturer in California.

Philip Hunt
Managing Editor

Key factors in successful innovation – a view from the US

What drives successful innovation? Top-down policies from government or bottom-up actions that involve the inventors and stakeholders themselves? William E Kennard, US Ambassador to the European Union, gives a view.

William E Kennard is the US Ambassador to the European Union.

Representing roughly 50 percent of global GDP and worth a total of 14 million jobs in Europe and the Americas, the trans-Atlantic economy is a key economic relationship. Yet while the EU and the US often seem economic rivals, when acting together on key issues they can do much to address imbalances in the global economy and build economic recovery at the same time.

Which is why eliminating trade barriers and coordinating regulatory actions, especially in emerging technologies, were the top priorities for the US/EU Trans-Atlantic Economic Council (TEC) in Washington in December 2010. The participants sought to identify policies that would spark innovation and underpin recovery. Their objective? To develop a consistent and predictable common environment for business that would encourage the development of new technologies, generate jobs for workers and growth for both economies.

PRIME DRIVER FOR GROWTH

Innovation is a prime driver for growth and long-term job creation, says William E Kennard, US Ambassador to the European Union. But too often innovation policy is seen only as government investment in research and development. This ignores other government actions that create the conditions in which innovation and private-sector investment can thrive.

A number of factors interact to produce the ideal conditions for innovation, he believes, using the example of the internet to illustrate his theme. A combination of factors lay behind the phenomenal growth of the internet in the 1990s, including California's networked universities and research institutions, a culture of risk-taking that fuelled venture-capital investment in start-up companies, research funding from the US government's Advanced Research Projects agency, a light-touch regulatory environment, favourable personal and corporate tax structures, and an intellectual property-rights system that allowed entrepreneurs to profit from their inventions. Finally, he notes, from 1995 to 2005, over half of Silicon Valley's

engineering and technology start-ups had one or more immigrants as key founders.

Collectively, he notes, these factors created an 'innovation ecosystem' that nurtured the Internet's incredible expansion. Similar innovation clusters produced Scandinavia's amazing wireless revolution, Spain's burgeoning renewable-energy industry, and the remarkable biotech cluster outside Boston.

BOTH TOP-DOWN AND BOTTOM-UP

"What all these 'innovation revolutions' had in common was an integrated, well-functioning innovation ecosystem, where government policy worked hand-in-hand with the private sector. The lesson is that innovation is a holistic process that cannot be supported by top-down government policies alone; it must also be driven from the bottom up with businesses and communities leading the way."

The good news, he says, is that both the present US administration and the European Union recognise this. "President Obama's 'Strategy for American Innovation' and the European Commission's 'Innovation Union' are comprehensive strategies to encourage innovation," he says.

"The US strategy combines government investments in education, infrastructure modernisation and R&D, with private-sector incentives such as research and experimentation tax credits. The EU plan includes a streamlined European Research Area and an EU-wide venture-capital regime designed to remove bottlenecks which stop ideas from reaching the market."

By working together, he believes, the US and the EU can launch a new trans-Atlantic era of innovation. But how is this to be done?

"First, we should coordinate regulatory policies and standards for new products and conduct joint research and development. We have done this before. By coordinating standards for online privacy in the late 1990s we helped accelerate the growth of global e-commerce."

Also, he notes, "Emerging technologies – renewable energy, smart grids, health IT, electric cars – offer promising areas for cooperation. In regulation and standard-setting for new technology platforms like smart grids or health IT, we can connect our markets through more unified rules, creating greater scale for innovation. We can create and connect trans-Atlantic innovation clusters."

"These are the discussions our leaders had in Lisbon, and these are the areas primed for progress, including at the Trans-Atlantic Economic Council meeting [17 December 2010]. If we get it right, we will give a boost to the trans-Atlantic economy, generating new jobs in sectors poised to lead our economies in the coming decades."

Trans-Atlantic Economic Council launches innovation action plan

The US/EU Trans-Atlantic Economic Council (TEC) launched on 17th December 2010 the inaugural Innovation Action Partnership (IAP) workplan, which will, for the first time, provide high level direction to joint EU/US efforts to strengthen innovation and promote the commercialisation of emerging technologies and sectors.

The IAP's three main areas of focus are, 1) develop innovation policies that encourage productive, growth-enhancing activities, 2) assure adequate access to critical raw materials through cooperation in the area of trade policy and on collaborative research, including on recycling and substitution, and 3) promote the development and use of bio-based, eco-friendly products.

Budapest – preparing for 2020

Budapest, Hungary's capital, is involved in two European energy-efficiency actions; it is an EU Energy City and a signatory of the Covenant of Mayors. These initiatives commit the participants to going beyond EU energy-policy objectives, to further reduce CO2 emissions through enhanced energy efficiency and cleaner energy production and use.

Members of the Covenant of Mayors for example commit to reducing CO_2 emissions in their territories by more than 20% by 2020 – thereby going beyond the targets set out in the EU's Energy and Climate Package. Local authorities have a key role in mitigating climate change; over half of greenhouse gas emissions are created in and by cities, which are generally home to around 80% of the population in Europe, and which consume up to 80% of total energy resources.

In Budapest, the city administration sees an efficiently organised energy system as a fundamental basis for energy security. Decreasing the energy dependency of the capital is a key target, and the city is focusing on energy investments which support Hungary's specific energy-generation policy, which is to support separate, self-sufficient heat and electricity supply among the city districts.

ENCOURAGING INVESTMENT CRITICAL

With budget restrictions limiting the capital's ability to accomplish large-scale renewable-energy projects on its own, such projects tend to be carried out with the aid of central liquid assets gained from tenders realised within the new Széchenyi plan.

Improving the efficiency of heating-energy and electricity-generating plants is made possible with the help both of open-market investments and those from public institutions, which have the additional advantage of being able to mobilise governmental and EU funds.

Budapest's own municipal energy agency manages the city's approach to reducing energy consumption, applying a standardised energy-utilisation concept across the capital. It is assisted by selected energy consultancies which help in the development of consumer-friendly energy practices.

The city is striving to make its heat-energy supply more environmentally friendly, making use of resources such as joint power generation, waste management, and distance-

heating using renewable energy resources.

KEY BUDAPEST ENERGY RESOURCES

In Budapest, production of joint electricity and heating power is mostly maintained by a system of distance-heating. Some 85% of this distance heating is gained from natural-gas based joint-energy production plants (natural gas being the city's most important energy resource).

An extended network of distance-heating plants delivers around 37% of the total energy used for heating in the city. However in addition the city gains both heat energy (waste-heat) and electricity from the waste-management plant in Rákospalota.

Two key developments for the future are a pair of biomass power plants that are being developed by Főtáv Zrt. These two plants will play a significant role in producing more heating energy for the city from renewable resources.

IMPROVING AIR QUALITY

Following a decision of the city's General Assembly in October 2010, Budapest is planning a major restructuring of its city transport systems. The eventual goal is to have more efficient and standardized transport systems that are also more frugal in energy use. These plans are at present under development.

With the establishment of the BKK Zrt, changes are under consideration for the contracting and procurement policies of the city's biggest public utilities (the BKV Zrt., FKF Zrt., taxis, etc.) and other transport services (city logistics or sightseeing buses), where areas such as environmental protection and energy use can take on greater significance. Approaches being examined include procurement of more modern and less polluting vehicles, but also ideas such as more pedestrianisation for down-town areas and congestion charging.

In procurement policies for public-utility vehicle fleets (e.g. BKV bus tender), the city is developing methods of promoting more modern drive-solutions and/or minimising the energy intensity of different systems, in an effort to reduce environmental harm and cut costs.

DEVELOPING AN ENERGY-SECURITY STRATEGY

A key concern for the city authorities is to develop an energy-security strategy for Budapest. To this end they are preparing "energy-cadastre" and energy-strategy reports for each of the capital's institutions. The objective is to achieve perceptible savings in energy-utilisation together with a heat-insulation strategy (measure, analyse, and potentially enhance), and to introduce utilization of renewable energy in the process. Key elements of the programme include switching the capital's institutions to energy-saving lighting, and developing a comprehensive green-roof and green-court programme.

Budapest also aims to introduce multiple reforms within its most important energy management institutions and tasks (e.g. procurement of energy, energy agency activities, energy consultancies). It intends to manage its whole approach to energy generation and use in a new and more centralised way, including procurement of electricity and natural gas, supervising building efficiency, defining necessary investments, identifying financial resources, developing tender materials, etc. The overall objective is to improve the energy-efficiency of the municipality, and optimise institutional expenditure on energy as well as that of the districts.

Inventing the future together

Central Hungarian Innovation Centre and ValDeal Innovations supporting students' solar energy project

The Solar Decathlon BME Team

HUNGARIAN TEAM AT SOLAR DECATHLON EUROPE INNOVATION CONTEST

The Solar Decathlon Competition is an international innovation contest of universities all around the world, organised by the U.S. Department of Energy and the Spanish Government since 2002. Its goal is to popularise the usage of solar energy in architectural solutions and to call into being the social and market support of green technologies.

A group of university students from Hungary submitted a successful tender to the contest, for this it can take part in the 2012 Madrid event, creating an innovative solar building. The 20 participating teams' performance will be juried on the basis of comprehensive criteria, like architectural, sustainability, energy-efficiency, construction, aesthetic and awareness. The jury also takes into consideration how the building can cope with the market needs.

COOPERATION PARTNERS FROM THE MARKET

The Central Hungarian Innovation Centre Nonprofit Company (CHIC) is Hungary's most experienced organisation creating a talent platform and network for inventors and innovative SMEs. CHIC is a recognised brand both in Hungary and abroad in renewable energy issues. It organises joint projects and consortia for the examination and dissemination of the usage of renewable energy sources, and aims to increase energy efficiency. Besides the use of solar energy CHIC deals with other sectors of the renewable energy market, having an important role in the coordination of the work of the Hungarian Hydrogen and Fuel Cell National Technology Platform.

ValDeal Innovations is Hungary's first business incubator and innovation management company, dealing with the commercialisation of Hungarian inventions. It considers the Hungarian project of the Solar Decathlon Competition a great opportunity for the presentation of the best Hungarian inventions and technologies on international markets. CHIC and ValDeal Innovations supports the sole Hungarian team and their project named Odooproject of Solar Decathlon Europe Competition, in cooperation with the Budapest University of Technology and Economics (BME).

THE ODOOPROJECT

Odooproject is named the project of Solar Decathlon

The Model of the Hungarian Solar Building

BME, a student team, that will represent Hungary and the Budapest University of Technology and Economics (BME) at the Solar Decathlon Europe Competition 2012. The team is composed by architects, mechanical engineers, electrical engineers, designers, environmental engineers and economists. Their aim is the construction of a solar-energy-powered house conforming to the needs of Hungary's environmental and social climate and also competitive on the market. In order to keep environmental damage at a minimum, the team tries to work with material readily available locally (such as wood or paper), and also applies a number of energy-efficient, innovative technologies. They are looking for further sponsors willing to promote the project by securing construction materials. For more information on the Odooproject and Solar Decathlon Europe, please visit www.odooproject.com

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EUROPE 2020
Interview with Hungarian Minister for National Development Tamás Fellegi

Hungary's Presidency of the European Union has come at a time of radical change in energy markets across Europe. As part of its commitment to the Europe 2020 plan, Hungary is expected to increase the ratio of renewable energy sources to 13% by 2020. Minister for National Development Tamás Fellegi explains how his government is going about it.

Q What is the progress on the EU REAP (Renewable Energy Action Plan) for Hungary?

A The Hungarian government considers this action plan as an opportunity. During the finalisation of the National Action Plan for Renewable Energy, the government restructured priorities in compliance with national interests in order to give momentum to solutions which have a higher local job creation potential.

In addition to promoting the realisation of energy and climate change policy objectives, these measures will serve Hungary's economic development, job creation and sustainable rural development. In effect, we hope that by boosting the green economy, the application and spread of renewable energy resources will become a breakthrough point for the Hungarian economy.

The Action Plan marks out all the grant programmes and financial incentives that may facilitate projects conducive to renewable energy utilisation. It includes an outline of the regulatory incentives and administrative methods for promoting the spread of alternative energy sources, and other measures (including education and awareness raising) are set out that will change social conditions to this end.

The Plan itself benefited from the support of a consortium established by the European Bank for Reconstruction and Development (EBRD), with members who have abundant experience in the analysis of renewable energy utilisation, policy building and the preparation of national action plans.

The calculations within the Plan were made in line with the Green-X model and co-ordinated by the Hungarian Energy Office. The energy utilisation trajectory was developed by the Economy Research Institute with reliance - amongst others - on the transport-related predictions of the Institute of Transport Sciences, a non-profit company.

Before its submission to the European Commission, the government held both public and professional consultations on the contents, giving industrial participants, civil, scientific and professional organisations the opportunity to comment on the draft. As a first step, seven professional forums were held, each with the participation of 35-40 organisations, to suggest content for the preliminary


Testing samples for likely energy content.

compilation of the draft. In the second step, specialists at the Ministry of National Development discussed the key contents with some 26 non-profit and social partners. The procedure closed with a consultation involving the wider public.

Similarly to the majority of EU member states, Hungary has set a more ambitious target (14.65%) than the 13% undertaking as an attainable ratio of renewable sources. The Hungarian government approved the final Action Plan on 22 December 2010, and the document was then submitted to the European Commission.

Q Which energy resources will be most significant for Hungary in achieving the target, and what kind of percentages will they be of the total?

A Due to its geographic and geophysical situation, Hungary primarily expects to promote the opportunities inherent in geothermic energy sources and biomass. Similarly, we expect an increase in the use of solar energy, primarily in the area of heat generation (e.g. solar collectors).

While electricity generation is a significant aspect of using renewable energies, it will have only a supplementary role in the plan. However in heat generation we can expect a major breakthrough in the use of renewable energy sources, primarily based on using biomass and geothermic energy. These developments may even bring production possibilities relying on Hungarian R&D, which could create thousands of new jobs.

The country has excellent agro-ecological features for manufacturing biomass in a competitive way that is sustainable over the long term. In rural areas, biomass is one of the most easily accessible and cheap energy sources. Thus its use for power generation goes beyond energy policy objectives and may even become a significant additional resource in agriculture and rural development.

Biomass could contribute to power-engineering objectives based on agricultural by-products, at the same time as allowing the replacement of fossil fuels and offering considerable job-creation potential. In terms of volume, up to 2020 the largest increase in renewable-energy utilisation will be seen in the use of solid biomass for power generation.

Regarding geothermic energy, the Hungarian geothermic average is nearly 1.5 times the global norm, thus making thermal energy one of the country's most significant resources. The widest possible utilisation of these opportunities will play a key role in achieving Hungary's renewable energy objectives.

Geothermic energy for heat supply can include for example heating buildings, homes, spas and greenhouses, and the supply of hot and cold water. Making use of such resources

to heat buildings is a priority task. The water yield and heat output of natural hot springs makes possible the supply of both major building complexes and district heating at many smaller communities. In the period to come, we must focus primarily on the economical use of these existing thermal energy capacities.

As shown above the planned use of geothermic energy serves primarily the purpose of thermal energy (district-heating, heating public institutions, residential buildings in local government ownership, market gardens, etc.). While widely used already, the exploitation of geothermic energy for heating could more than treble by 2020.

Q Do you also plan any innovative energy approaches in the area of new fuels? For example in reducing greenhouse gas emissions?

A Similarly to solid biomass, Hungary's outstanding agro-ecological features have a high biofuel manufacturing potential – both for first-generation and even more for second-generation biofuels. Over the next decade, Hungary will endeavour to use raw materials, especially in the field of liquid biofuels, that do not compete with food production. Priority will be assigned to production systems utilising cellulose and lignocellulose.

In agriculture, and specifically animal husbandry, the Hungarian model includes the promotion of small-size biofuel production plants with a capacity of 5-10 thousand metric tons per annum, operated with raw materials deriving from local resources within easy reach, i.e. not exceeding 40 km in distance.

On the use of biofuels – current technology limitations restrict the wider take-up of biofuels in transport. We need to promote the use of vehicles more suited to using high-biofuel content in engine fuels, especially in mass transport. To this end, in the years to come the infrastructure facilitating the spread of green mass transport, including manufacturing and innovative capacities, must be improved.

Q Will cogeneration of heat and power remain an important part of the energy generation mix, and how does this work in practice? e.g. which fuel sources are best suited for cogeneration approaches?

A The role and benefit of cogenerating plants is inevitable in Hungary's power system. Now however, new and very strict requirements have to be applied as a condition of granting support; namely, the need to prove an actually existing heat market. Previously, plants suitable for heat and electricity generation were often built without this requirement. Consequently, such plants could sell electricity at a higher price and operate as a paying venture even if heat energy was released to the air.

In order to achieve genuine efficiency, we want the investment to be repaid by selling heat energy to local communities at lower prices. Since the primary goal is not electricity but heat generation, this means that the government is not thinking in terms of large power plants, rather it wishes to support local solutions in the first place. For these power plants, the use of biomass and biofuels as well as terrestrial and thermal heat are being encouraged.

Q Will meeting the targets require the construction of new power stations? And if so, of what type?

Hungary's renewable-energy resources as part of total energy consumption, 2010 and 2020

Energy carrier	2010 (PJ)	2020 (PJ)	2010 (%)	2020 (%)
Water power	0.66 PJ	0.86 PJ	1.07%	0.71%
Geothermic	4.50 PJ	16.48 PJ	7.30%	13.67%
Heat pump	0.16 PJ	6.00 PJ	0.26%	4.98%
Solar energy	0.25 PJ	3.29 PJ	0.41%	2.73%
Wind power	2.45 PJ	5.57 PJ	3.97%	4.62%
Biomass	42.60 PJ	61.18 PJ	69.10%	50.75%
Biogas	2.03 PJ	4.78 PJ	3.29%	3.97%
Transport	9.00 PJ	22.4	14.60%	18.58%
Total (excluding transport)	**52.65 PJ**	**98.15 PJ**	**100.00%**	**100.00%**
Total (including transport)	**61.65 PJ**	**120.55 PJ**	**100.00%**	**100.00%**

"Hungarian geothermic energy is nearly1.5 times the global norm, making thermal energy one of the country's most significant resources."

A According to expert forecasts, Hungary's electricity consumption may increase by 1.5% per annum on average up to 2025, initially slowly but probably gathering pace later on. The total amount of additional requirement calculated up to 2025 is not likely to significantly exceed 1500 MW, which could be covered if the current 9000 MW capacity is gradually increased.

However in the next few years, out-of-date power plants producing roughly 4000 MW will need to be put out of service. For this reason at least 6000 MW of new electricity generation capacity will be required between 2009 and 2025. Roughly one third of the requirement may be covered by newly built nuclear-power capacity. The rest must be provided from other sources, primarily from renewable energy resources, or perhaps through combined plants connected to natural gas if the local provision requirements can be met.

Q What are the advantages of decentralised energy generation, rather than large centralised facilities? Is there a place still for smaller power stations that are optimised to use local renewable sources?

A The 2030 energy-policy concept currently under finalisation relies heavily on local energy-generation capacities. According to the plans, energy sources required for local electricity plants and heat generators will be from resources produced within the region. These resources can come from forestry and agricultural by-products, the product of energy plants and biogas. The point is that energy will be generated and used within the same region.

For this reason, we expect to see the presentation of complete product paths in the tender applications. In our experience, such systems can secure a living for 50-60 people in a micro-region. A further economic benefit is the fact that these employees will spend their income locally, and thus the local community will profit from them.

Q Can you indicate what level of resources are earmarked for supporting investments in the renewable energy sector under the National Development Plan?

A The Government intends to finance the use of renewable energy sources from various funds, and the tenders announced in the New Széchenyi Plan - based on funds granted by the European Union - provide only a part of these. This grant form will support investment projects by approximately HUF 40 billion (approx. EUR 150 million).

Budapest University of Technology and Economics the residence of R+D+I

BME has been awarded with the "Research University" title in 2010 and parallel to the TÁMOP grant a comprehensive development programme has been launched to refurbish the professionalism of the University in five major research areas as follows:

- Sustainable energy
- Vehicle technology, transport and logistics
- Biotechnology, health and environment protection
- Nanophysics, nanotechnology and materials science
- Intelligent environment and e-technologies

The research programme strengthens the university being recognized as an outstanding institution of innovation in Hungary and become a European level upper-class university.

BME's mission is to contribute to energy challenges with effective solutions through its research programmes. The most crucial is to secure the sustainability of energy supply – its competitiveness, its security of supply, environmental and climate protection – in balance with the financial pressure imposed on society.

IMPLICATIONS AND SUGGESTIONS

Based on the goals of the research strategy the key issues for education and research form four groups:

RESEARCH

Current BME energy researches lay out the fundamentals for the successful completion of the strategic objectives. The research fields and aims are the following:

Competitiveness: Contribution to a cost effective energy supply that reinforces sustainable development; increasing energy efficiency; developing a knowledge base for energy policy.

Environment and climate protection: Decreasing global and local pollutant emissions; carbon-free and carbon neutral electricity production and its system level support; cogeneration; increasing and complex utilization of renewable energy sources

Supply security: Safe nuclear energy; limitation of natural gas use; increased use of domestic fuels.

EDUCATION

Research findings and experiences are constantly built in the education. MSc and PhD students progressively participate in university researches. Jointly with our industrial partners, we set-up and run a motivation programme in order to support the career growth of talented youth.

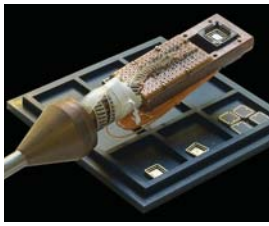
KNOWLEDGE TRANSFER

Information exchange plays a vital role in the co-operation between the university and its industrial partners (multinational companies or SMEs). In relation to research, it is worthwhile to exploit the opportunities offered by the knowledge transfer infrastructure of the university and also to actively participate in further improving this system. Besides, the continuous development of cooperation among research facilities within the university is our priority.

COOPERATION

We enlarge the cooperation with new partners and improve it among BME, other domestic and foreign research facilities (universities, research institutes) as well as national and international energy and energy policy organisations.

While achieving strategic goals, BME is aspired to maintain its leader role as well as to strengthen cooperation with industry partners on RDI projects and to join the new Széchenyi Development Plan.



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Development of quality oriented and harmonized R+D+I strategy and functional model at BME
TÁMOP-4.2.1/B-09/11/KMR-2010-002
Budapest University or Technology and Economics

Competitiveness and energy efficiency go hand in hand

Edit Herczog, MEP

The coming EU Energy Roadmap 2050 aims to decrease greenhouse emissions by 80%, and at the same time, increase energy efficiency by 20%. In spite of strong political commitment, a significant question has to be raised, namely, how will the community finance all this? My argument is that beyond the environmental aspects, the economic need to increase competitiveness is also pointing towards greater energy efficiency.

Energy efficiency has undoubtedly begun to find a place in the minds and communications of EU decision makers. During discussions on green energy and the low-carbon economy, the issue of increasing efficiency on both the consumers' and the producers' side is now a common one.

Yet Europe today still shows a rather diverse picture in this field. It is not uncommon for a Hungarian confectioner to produce ice cream using three times as much energy as his Austrian competitor. And while nine out of ten entrepreneurs in Europe believe that an energy due-diligence would result in cost savings, only a quarter of them actually seek professional advice.

It is alarming that the share of those seeking advice on energy efficiency reaches 40-50% in Germany, Austria or Belgium, while the figure remains at only 15% among central-European entrepreneurs. The same applies for households.

The EU has realised that households and public buildings account for 40% of the continent's energy consumption and 36% of its emissions. Tightened regulations in this area are, it seems, unavoidable.

More and more people now emphasise the significance of efficiency improvements, not only on the consumer side, but in technology development for production and transportation. The replacement of outdated power plants, pipelines and the development of intelligent networks are the most urgent tasks. The last one alone could result in a decrease of consumption by 9-10% in Europe; it is enough to take into consideration the impact of intelligent metering.

And this is where we face the problem; nearly 1,000 billion euro are necessary for improving energy systems, of which the modernisation

of networks alone accounts for 200 billion. Even including potential private sector investments, at least 100 billion in public investment is missing.

Yet the room to manoeuvre in decision-making is shrinking. With the restructuring of the global economy, we increasingly have to face the fact that economic competition has become the competition of large regions. In this respect the EU is lagging behind. While Asia and the USA seem to be getting out of the crisis, the EU is not. Due to its political structure, the EU remains much engaged with its own internal problems, a factor that not only forms an obstruction to dynamic development, but also hinders a series of (energy) strategy decisions.

To indicate the fierceness of the competition faced, the EU's SET Plan has earmarked 73 billion dollars for the development of clean energy technologies. This figure may seem huge at first, but it soon comes to seem like Gulliver arriving in the land of the Giants. According to a recent report, the Asian clean-energy tigers are spending over 500 billion dollars on research between 2009 and 2013, compared to the US 170 billion (which includes investments that have already begun).

We must not forget that by investing in the energy sector we create huge economic potential. The implementation of all the projects needed in the field of transfer and transport infrastructure between 2011 and 2020 could result in the creation of 800,000 jobs and increase the total GDP by 19 billion euro by 2020.

However, it is not only the capital needed to take these urgent steps that is missing in Europe. Rare-earth elements, necessary for the digital revolution and clean technology are exclusively to be found in China; and, according to the latest news, the Asian superpower uses its raw material wealth to serve its own economic interests.

As if this is not enough, then we can also touch upon the lack of engineers, which has a multiple effect on Europe. This issue is not just about the technology-skills gap between Europe's ageing population and the younger population of the emerging regions. Take a close look at the world's innovation map, and besides Silicon Valley and the Asian Tigers, you will find hardly any significant European innovation hub. But the world's technology-patent centres are able to provide attractive conditions, careers and high salaries to masses of talented young engineers.

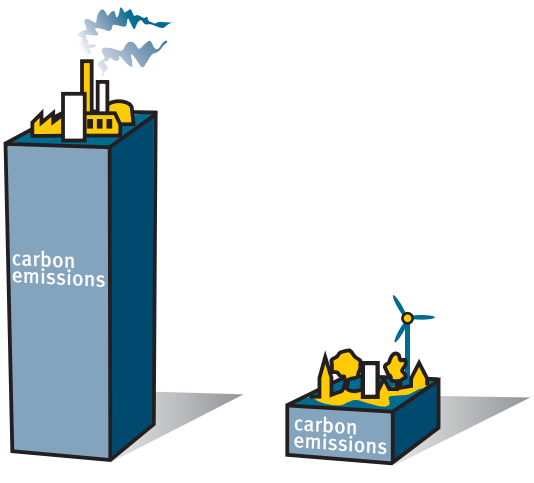
So we can see that apart from declaring energy-policy objectives, several real diplomatic, education and science-policy aspects have to be taken into consideration if we are to achieve real progress in the field of energy efficiency. What we need is speed – remember that the single non-renewable resource is TIME.

Edit Herczog, MEP

Europe's cities – crucial in the climate race and looking for a winning strategy

As 75% of the EU's population live in towns and cities with more than 5,000 inhabitants, climate action is expected to be concentrated in Europe's cities. Here is the background:

- The global policy goal is formulated as follows: "to keep the increase in global average temperature below 2°C above pre-industrial levels" (Cancun Agreement).
- The aim of energy policy is to transform Europe into a highly competitive, energy-efficient, low-carbon economy, while securing the supply and affordability of energy.
- An EU Commission draft "A roadmap for moving to a low-carbon economy in 2050" splits the overall EU carbon reduction target of 80%-95% by 2050 into targets for different sectors.
- The target for the built environment is a 90% reduction. This is reflected in the Energy Performance of Buildings Directive (EPBD), requiring nearly-zero energy, i.e. all new buildings in Europe should be virtually carbon-neutral by the end of 2020 at the latest.



In its 2011 Energy Efficiency Plan the EU Commission puts buildings and cities in the spotlight. Ongoing programmes such as Intelligent Energy for Europe (IEE), the Covenant of Mayors and the new Smart Cities Initiative together showcase innovative cost-efficient approaches to achieving the low-carbon cities of the future and offer attractive incentives for frontrunners.

However, there are big differences between the approaches. While some cities have already implemented sophisticated climate concepts, others have only just put the topic on their agendas. The extent of the challenge and the long timescale for climate action creates a high risk of insufficiently thought out, potentially irreversible decisions. This is why sufficient support for urban policy and planning is so important.

The IEE project group POLIS (www.polis-solar.eu) assessed the solar energy capabilities of various European cities' structures. This project brings together Lyon and Paris (France), Munich (Germany), Vitoria-Gasteiz (Portugal, plus expertise from Spain) and Malmö (Sweden), each of which has a different context and experiences and is in a different stage of urban development. Representatives share knowledge on urban solar planning and encourage further activities within a network of experts. Key activities are identifying solar potentials based on an urban fabric analysis, realising these potentials, implementing concrete urban planning measures, as well as improving financial and legislative measures. Interim results include draft solar action plans and pilot actions in the cities. The aim of POLIS is to optimize the implementation of solar systems in urban structures. An integrated interdisciplinary planning process will boost solar development in the participating cities. POLIS' pool

of successful examples, strategies and instruments will soon be available for other cities.

An award-winning climate concept for Norderstedt (Germany), which is supported by the German Ministry of Environment, is used to guide the city's decision makers on strategies, measures and related costs and benefits in order to achieve their ambitious 2030 carbon reduction targets. Recommendations include optimising energy efficiency in buildings through renovation, a long-term approach to developing urban low-carbon districts, the use of renewable sources of energy and district heating, target-group tailored campaigns and the participation of both target groups and investors.

Geographical Information Systems (GIS) were used in an innovative way. GIS allows the structuring and merging of large amounts of data, creates transparency and credible results, and visualizes these results on the town map, e.g. the location of different types of urban area, energy supply structures and heat demand in buildings. As a result, policy makers can make informed decisions on policy priorities and priority areas in their locality.

infrastructure | heating demand | solar potential

GIS based visualisation of different urban sustainability aspects
Source: Ecofys

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About Ecofys - www.ecofys.com
Ecofys is a leading knowledge and innovation company that operates in the field of renewable energy, energy efficiency and climate change. We deliver research and service solutions from product development to implementation management. Our clients are energy companies, financial institutions and corporate businesses, governments and local authorities, international institutions, project developers, housing associations, building companies and energy consumers around the world.

Expectations for algae based biofuel production

Tredici M.R.

Microalgae have been identified as a possible alternative source for biofuel production and in recent years the interest in these photosynthetic microorganisms has exploded. The main reasons for such recognition are that microalgae are considered far more productive than traditional crops used for the feedstock production, do not compete for fertile soils, require no pesticides and can be produced in seawater or using agricultural, industrial or domestic wastewaters. In addition, algal cultures consume large amounts of CO2 (about two kilograms of CO2 per kg of algal biomass) while producing feedstocks suitable for both biodiesel and bioethanol production, high quality proteins for the food, cosmetic, chemical or nutraceutical industries as well as treated water.

In spite of the inherent potential of microalgae as a renewable fuel source, no company seems to possess yet a mature technology able to compete with fossil fuels. The higher capital and operating costs of microalgae farming compared to conventional agriculture, and unverified positive energy balance and sustainability still prevent the development of the technology to commercial scale. Yet, it is clear that the industry is growing and full commercialisation is a question of when not if.

The most important barriers that must be cleared are:

- Production of selected strains at the large scale required for biofuel production (hundreds of hectares) must be proven.
- The Net Energy Return for algae based biofuels must at least compete with current alternatives.
- Fully loaded production costs of algae biomass should be less than €0.5 per kg.

However, like crude oil, algae production also generates by-products such as protein, carbon credits/related products and treated water that also need to be considered, as oil may be a minor component in the biomass.

ADVANTAGES AND CURRENT STATUS

Microalgae present several advantages over plants as source of biofuels.

- Have less dependency on seasonal variations and require less freshwater than conventional agriculture
- Cultivation in arid regions is possible
- Do not require herbicide or pesticide applications
- Can fix efficiently CO2 from different sources, including industrial exhaust gases
- Can use nutrients contained in wastewaters for their growth
- Can accumulate sugars, which can be fermented to produce bioethanol
- Can synthesize many valuable co-products such as proteins, vitamins, hormones and polyunsaturated fatty acids that can be commercialized to integrate foods and feed
- Can be cultivated on land unsuitable for agriculture using saline or brackish waters.

These benefits have drawn significant interest from companies and investors in recent years. In Europe at least 20 large projects related to algae biomass and biofuels have been launched within the Seventh Framework Programme of the European Community. Three of these, BIOFAT, ALL-GAS and InteSusAl, approved within the "Biofuels from algae" call, aim to demonstrate the feasibility of algae biofuel production at the 10-ha scale. However in the US, signs of a rethinking start to appear. For example in February 2011 Shell quit its algae biodiesel research project because a commercial future was not seen, or the recommendation (strongly opposed by the Algal Biomass Organization) of the RAND Corporation's January 2011 report, "Alternative Fuels for Military Applications," that the military should abandon its efforts focused on utilizing fuels derived from biomass, including algal biomass .

On one hand, we must accept that mass algae cultivation is a complex not yet well-understood process, on the other it is to say that many companies in the US did an early (and too enthusiastic) start based on the fact (untrue) that algae can provide 100 times as much biofuel per hectare than traditional crops. This has complicated the market development,

but at the heart of algae development is the question of production on a commercial scale.

PRODUCTION PROCESS

World commercial production of microalgae amounts to less than 10,000 tons per year, mainly marketed as high-value human nutritional supplements, specialty animal feeds and pharmaceutical products . Most of the production is from open ponds or lagoons rather than closed photobioreactors (PBR) and this is due to cost. At the large scale, photobioreactors are more expensive to build and operate than raceways ponds, and this element is critical for commercial production.

Most of the start-ups in the algae biofuel sector, both in the US and Europe, focus on PBR as cultivation systems, but few designs have been tested at pilot-scale and none developed at the (large) scale necessary for a complete evaluation.

The benefits of photobioreactor technology are mainly:

- It provides a close more controllable environment.
- May achieve a higher efficiency of solar energy conversion compared to open systems.
- Limits the risk of contamination.
- Allow more species to be cultivated.
- Achieve a higher cell concentration with significant savings in harvesting and medium preparation and handling.

Unfortunately these advantages rarely translate into a significantly higher areal productivity and compensate for the higher cost of PBR, although new designs are emerging all the time, such as the GWP-II (commercialized by Fotosintetica & Microbiologica Srl, Italy) that shows construction costs similar to or lower than those of lined ponds.

Although open ponds are much cheaper to build and operate than PBR, they are strongly limited by contamination (by other algae, grazers, bacteria) and local climatic conditions (for example the difficulty of maintaining open algal cultures during the tropical rainy season). Many believe that the solution will be in combined systems: photobioreactors for inocula production followed by open ponds for bulk cultivation. This combination of production approaches is fundamental for algae based biofuels. ●

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Biogas, where fuel versatility meets renewable utility

It is now apparent that the world needs an urgent rethink of its dependence upon fossil fuels, in favour of developing renewable energy sources. A great deal of progress has been made with many technologies, including wind power, photovoltaic electricity and the use of biomass, but perhaps it is also time to take a closer look at one fuel that may have been overlooked: Biogas.

Biogas is a fuel similar to natural gas, and consists mainly of methane. It is produced by the anaerobic decomposition by microorganisms, of food waste, manure or energy plant crops; some is also produced in sewage plants and landfill sites. The most common use for biogas is in combined heat and power plants (CHPs).

Wherever it has been used in Europe, biogas has shown itself to be an extremely versatile energy source. Not only does it provide electricity and heat, but it can also be used as a transport fuel, or even fed into the conventional national gas grid. But biogas has another major advantage: aside from within the gas grid, it can be easily stored in suitable storage tanks. This means that biogas can be held on tap and used to balance the natural variations in the output of other

renewable technologies, as well as boosting electricity supply at times of peak demand.

Sattler AG is a family business, now into its fifth generation. With thousands of its installations in use worldwide, it has been the leading force in the storage of biogas for thirty years. This is principally because it believes that the storage of a versatile fuel requires a versatile approach. The external versions of Sattler's threequarter-spherical, double membrane gas storage tanks have become the industry standard for gas storage at pressures up to 50mbar and capacities up to 10.000m³, while the tank-mounted versions may be placed on concrete or steel tanks for use in the agricultural setting.

Sattler AG believes that biogas merits greater consideration in any future renewable energy portfolio planning. But it would also argue that, with an extensive installation base in Germany and a great deal of accumulated experience, there is already a sound platform for producing more sustainable energy from this fuel. Biogas - the renewable all rounder.

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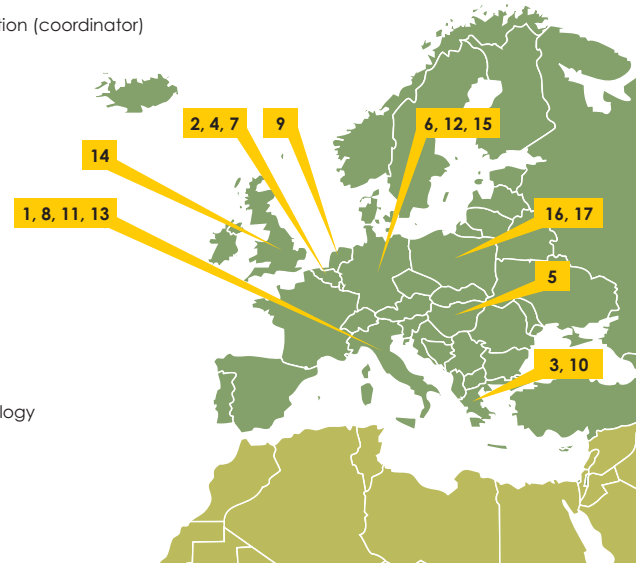
DEBCO Project

DEBCO (Demonstration of Large Scale Biomass Co-Firing and Supply Chain Integration) project is a collaborative project in the framework of FP7 program, that involves 17 partners. Enel Engineering and Innovation is the coordinator. The project started in January 2008 and will last four years.

PARTNERS:

1. Enel Engineering and Innovation (coordinator)
2. Electrabel
3. PPC
4. Tractebel
5. Matuz
6. University of Stuttgart (IFK)
7. Laborelec
8. RSE
9. ECN
10. CERTH
11. Agriconsulting
12. VGB PowerTech
13. IFRF
14. Doosan Babcock
15. Alstom Power
16. Wroclaw University of Technology
17. PCC Rokita



The DEBCO project responds to the need for further operational experience in high share biomass co-firing using different type of fuels. The project aims to demonstrate and assess, on a long term basis, the advanced and innovative co-firing techniques that are capable of achieving higher shares of biomass up to 50% more on a thermal basis. These objectives will be achieved through a programme of research activities and large-scale demonstrations.

Three demo plants have been selected for the long-term monitoring and assessment of the most relevant applications such as: different fuel supply chain scenarios, fuel qualities (agriculture residues, energy crops, wood pellets, RDF – Refused Derived Fuel), investigation and evaluation of the advanced co-firing techniques with particular attention being paid to the critical plant areas, i.e. fuel handling and injection, combustion and boiler performance, boiler integrity (slagging and fouling, corrosion), performance of flue gas cleaning devices, overall electricity net efficiency and the utilisation of the solid residues.

The three demo plants under investigation are:

1. Rodenhuize power plant – GDF Suez (Belgium): the main issue of the Rodenhuize demo activity is the demonstration of large-scale biomass co-firing at increasing share up to 50% of thermal input and the basic design of pc-boiler

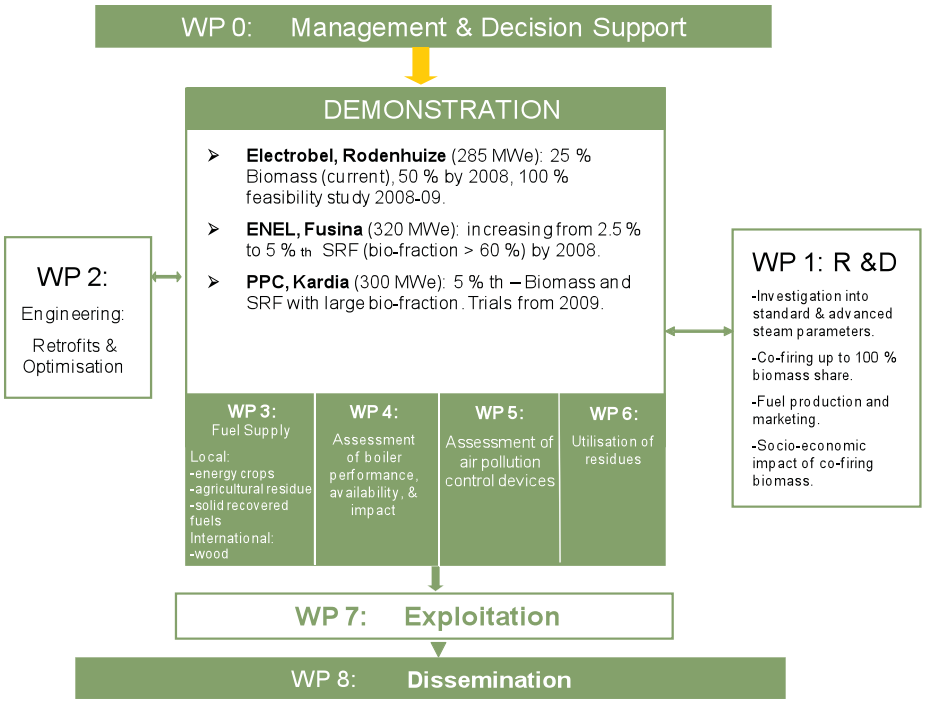


Figure 1: Scheme of activities organization of DEBCO project.

conversion to 100% biomass combustion. Now the refurbishment of the power plant to 100% biomass is on-going.

2. Fusina power plant – Enel (Italy): the demonstration activity aims to assess and extend the operational experience of co-firing biomass with specific focus on the use of Refused Derived Fuel (RDF) containing large share of biodegradable fraction. Since 2004 RDF co-firing has been performed continuously on two 320 MWel coal-fired boilers, with a share of 5% of thermal input on each unit.

3. Kardia power plant – PPC (Greece): the aim of the Kardia demonstration project is to investigate the possibility to use biomass or even other secondary fuels characteristic of the Greek region for large co-firing application with local lignite.

The demonstration activities are supported by the R&D activities and the required engineering activities to implement necessary adaptations. A scheme of project organization is shown in figure 1.

The practical experience and technical know-how developed within the DEBCO project will be reported in a series of guidebooks and dissemination of relevant information and results to technical and non-technical audiences. The overall objective is to enhance the future use of biomass and to facilitate the creation of a sustainable energy market across Europe.

The experience of DEBCO project will be relevant for future co-firing projects including both the retrofit of existing plants and greenfield advanced coal-fired power plants. This will assist the ongoing efforts in most European countries to increase the portion of electricity supplied from renewable sources.

DEBCO project: www.debco.eu
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Solar air-conditioning in residential sector: the potential of parabolic trough collectors

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The energy demand has been increasing in the last decades due especially to the continuous economic growth of emerging countries: in 2008, EU and Member States signed a commitment for the 20% reduction of the CO2 emission, the 20% increase of the energy efficiency and of the use of renewable energy sources, in respect of 2005 levels, but, there is still a long way to run for the achievement of targets in 2011.

However, very important results have been achieved for what relates to the spreading of renewable sources, in particular for solar energy systems, both photovoltaic and thermal. In the last years research activities have been focused to the development of Concentrated Solar Power Plants (CSP) based on the use of parabolic trough collectors (PTC) with large aperture and high-concentration ratio, which are able to produce electric power by converting the sun's energy into high-temperature heat (about 450°C). Many CSP plants have been already installed all over the world, especially in the USA, Spain and Italy, and first results have been highlighting the large potential in the energy market, especially in Europe.

The CSP is a big portion of the global energy market but there are still other sectors in which the use of solar energy systems would be very interesting: an ESTIF study (European Solar Thermal Industry Federation) made on 2009 highlighted that there is a very important market in the industrial process heat and in the heating&cooling sectors (Figure 1).

In 2006, the final energy demand in the EU-27 countries was 13,609 TWh: industry was accounted for 28%, the transport sector for 31%, the households sector for 26% and the service sector for 15% of the overall final energy demand. Besides the transport sector all the other sectors show considerable heat demand

Figure 1 Final energy consumption by sectors in EU 27 in 2006
[Total : 4640 TWh]

Figure 2 Final energy consumption in EU 27 : share of heat in 2006
[Total : 13609 TWh]

and therefore a potential for solar thermal energy use: the total heat demand in the EU-27 was 6,668 TWh (49%) and the low temperature heat was accounted for 4,640 TWh, which was 34% of the total final energy consumption (Figure 2).

Those results demonstrate that, if solar thermal will contribute significantly to the overall heating demand in the EU-27 countries then the main focus must be on the industrial and residential sector.

The European market is very diversified and sophisticated, in fact, it includes not only small-sized systems for the DHW production, for the space heating for the residential and commercial sectors, but also large-sized for the district heating, the air-conditioning through solar heating&cooling (SHC) applications and, finally, for the production of industrial process heat (Figure 3Errore. L'origine riferimento non è stata trovata.).

If the focus remains on small-scaled solar thermal systems solely then the contribution to the renewable energy goal of 20% of the total final energy demand will be limited

Actually, energy collectors most used in the solar thermal sector are the flat plate collectors (FPC) or the evatuated tube ones (ETC) but those solution have very important weak-points in respect of the PTC collectors especially in terms of costs and energy efficiency at temperature above 100°C: PTC collectors provide higher energy efficiencies than the FPC and ETC in temperature ranges higher than 100°C (up to 250°C) and they are able to provide direct steam generation

The PTC is a system that tracks constantly the sun and concentrates the sunlight onto a central stainless-steel tube receiver with a selective coating that transfers the heat to a thermo-vector fluid.

PTC collectors for CSP system already demonstrated their economic feasibility with the electric energy market, but they still have limits at lower temperature which are connected especially to the technologies used for the construction of the system and related costs. In fact, large-PTC collectors are optimized for operating at about 400-450°C, and at that temperature the vacuum-chamber receiver tube and the very accurate tracking system are expensive. Large PTC solar system has not yet entered the residential air-conditioning and the industrial process heat market at low-to-medium temperature (in a range from 100°C to 250°C) due to technical and economic reasons especially connected with the very high target price cost of collector derived from CSP plants and the low efficiency at lower temperatures (below 100°C) due to the use of only the direct component of the solar radiation (instead of the global as the ETC and FPC)

Nevertheless, many research activities have been carried out in order to develop smaller PTC collectors feasible with applications at lower temperatures (T<250°C) in terms of energy efficiency and costs.

In last decade, many research project have been financed by the EU in the 6th and 7th Framework programs (FP6, FP7), mainly focused on the development of small scaled energy systems that would exploit the solar energy for the combined production of heat and cooling energy (SHC plants).

In FP6 projects like the REACt (co-ordinated by the University of Florence in co-operation with DLR, SOLITEM, CDER, NERC and ALMEE) it had been possible to evaluate and solve all the problems connected with the design of the plant and to assess the potentialities of a SHC plant based on the coupling of small PTC collectors with commercial

Figure 3 Final energy consumption for heating and cooling in EU 27 in 2006
[Total : 4640 TWh]

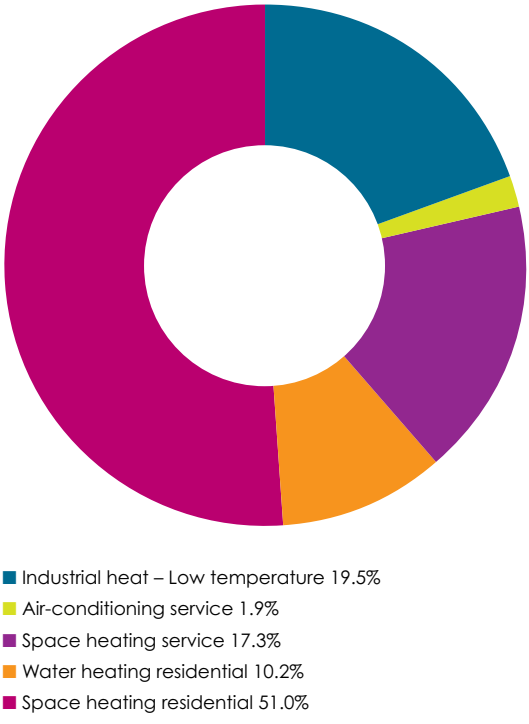
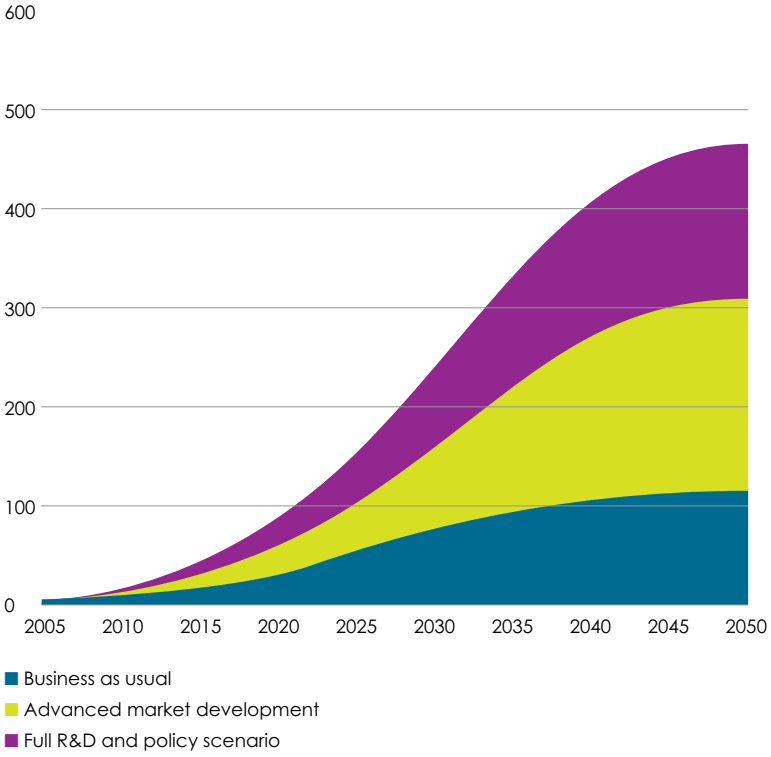


Figure 4 PTC collectors for SHC and Industrial process heat installed at the UNIFI's test facilities

absorption chiller appropriately modified for the purposes. Results of the REACt, as for other FP6 project, have been used as knowledge backgrounds in FP7 projects for the monitoring and evaluation of SHC plants based on the coupling of different solar collectors (FPC, ETC, PTC) with different chiller technologies. Some of them are still in progress, like the FP7-ALONE, co-ordinated by the University of Florence in co-operation with EURAC, DLR, SOLITEM, CLIMATEWELL and RIELLO, that foresees the installation of 2 SHC plant based on 2 different solar collector types (PTC vs. ETC) and chiller technologies (Ammonia-Water vs. Lithium Chloride-Water).

Moreover, the University of Florence have been involved in research project for the the development, optimization and manufacturing of small-PTC collectors for SHC and industrial process heat applications, that have been tested in the last years and that are going to be industrialized and proposed to the solar thermal market (Figure 4).

Figure 5 Solar Thermal Potential in EU 27 based on three different scenarios [ESTIF, Potential of Solar Thermal in 2010]



Above-mentioned demonstrative projects highlighted the feasibility of PTC collector for SHC applications for residential and commercial sector, in addition, an ESTIF study (2009) forecasted that in 2020 the contribution of solar thermal to the low temperature heat demand of the EU-27 will be between 0.8% and 3.6% and the corresponding annual solar yields would be within 38 TWh and 155 TWh. The specific collector area needed to reach these goals would be between 0.2 m² and 0.8 m² per inhabitant and the resulting total collector area will be between 97million m² and 388 million m².

In a long-term view, In 2050, the potential of solar thermal to the low temperature heat demand of the European Union (EU-27) could reach an order of 30-40% and the corresponding annual solar yields would be in the order of 1000 TWh. The specific collector area needed to reach these goals will be between 3 m² and 5m² (RDP) per inhabitants and the resulting total collector area will be between 1.5-2.5 billion square metres (Figure 5. ESTIF, Potential of Solar Thermal in 2010)

Those data are underestimated, since there is a significant share of the energy demand located into the industrial process heat sector: European Union recently published a call for proposal in the 7th Framework Program that foresee an investment of about 20 millions of euro in the development of low/medium temperature solar thermal energy system for industrial process heat production.

Small scale Renewable Energies Projects in Diputación of Huelva

Several European projects for implementation and promotion of renewable energy are being developed in Huelva (Spain) among which are projects of small wind, small hydro or biomass.

RURAL-RES
Six partners from different mountain and rural EU territories, ECWT(GR), SESO (CZ), Sun Valley (RO), Agena (IT) and Energikontor Sydost (SE),led by Diputación of Huelva(ES) together with a relevant European Association, ESHA, have been driving this initiative called Rural-RES part of the IEE programme.

The main objectives of the project have been to promote good practices on grid-connected small hydro power plants and off-grid and grid-connected small wind power installations in rural and mountain areas identifying and quantifying the local potential in each of the 6 participating regions for the use of mini-hydro and mini-wind power, conducting pre-feasibility studies and impact assessments and achieving local agreements on further exploring the opportunity to set up / restore mini-hydro power plants and mini-wind installations in participating regions. Project results have been disseminated through agreements with relevant training and education centres whose courses will now benefit from lessons learnt on the ground. Agreements for new installations have also been reached to act as trailblazers in these fields of renewable energies. All this information as well as pre feasibility studies, surveys and much more can be consulted and downloaded in the Project Website.

WICO
WICO is an experimental project belonging to Interreg IV C POWER Programme. It involves partners from UK(Marine South East), Italy(Province of Ravenna) and Spain (Diputación of Huelva) and is providing interesting information about the potential applications of small wind turbines along the coastal lines as well as identifying different drivers (technical, policies, market...) that avoid the deployment of small-scale wind turbines as part of the push toward wider uptake of renewable energy schemes that are essential to avert the feared climate change. The project particular focus is influence local planning rules and simplifies the installation of small wind systems in coastal areas increasing the exploitation of coastal winds through different tools as guidelines for politicians and municipal technicians, commitments with municipalities or coastal companies to develop specific small wind bylaws or facilities agreements as well as public awareness campaigns. The project guidelines will be presented in Brussels on 14 April, 2011 within EUSEW.

ITACA
The EU urban regions in the ITACA project –Andalusia(ES), Stockholm region(SE) , Noord Brabant(NL),Emilia Romagna region , Rimini and Ferrara(IT)- as well as the Spanish partner INTA ,trough their respective partners Diputación de Huelva,

Lidingö city, Brabantse Milieu Federatie and INTA and Italian regions as themselves, share the ambition to reduce carbon emissions from traffic. In this project the partners exchange information and experiences on policies and measures with special focus on innovative technologies and management models for people transport. With them a Handbook containing all this issues as well as a complete comprehensive database including the results of previous successful projects in innovative technologies is being developed.

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Driving the future car today 1
Honda's hydrogen fuel-cell pilot in California

Philip Hunt

There are electric cars and electric cars, but in the choice between batteries and hydrogen fuel-cells as energy source, one global auto manufacturer has made its decision and taken a punt on hydrogen.

Honda has invested heavily in the technology with the launch of the FCX Clarity – a fuel-cell electric vehicle or FCEV with a hydrogen fuel-cell as power source – in early 2010.

WATER VAPOUR AS EMISSIONS

The FCX Clarity, a medium-sized four-door saloon, is classed in the US as a Zero-Emission Vehicle (ZEV), i.e. the only emissions it gives off are water vapour and heat. Rather than being dependent on plugging in to charge the batteries at frequent intervals to give a worthwhile range, the FCX Clarity has a hydrogen fuel-cell as its power source, giving a total reach of around 240 miles without refuelling.

The fuel cell in the Honda combines hydrogen from a storage tank at the rear of the vehicle with oxygen from the air, and generates electricity from the conversion process. This electricity is used to charge lithium-ion batteries, which in

turn supply the car's electric motors with power.

Honda has launched a significant pilot programme to test the concept in the Los Angeles area of California. There, around 200 vehicles are being offered for lease between 2010 and 2013, at a cost of US$ 600 per month over the three years.

REFILLING WITH HYDROGEN AT HOME

A key challenge in the sales strategy for the pilot was how to create a wide enough network of refuelling stations to encourage the use of fuel-cell electric vehicles by consumers. Honda's answer to this issue was to come up with a way of refuelling the car at home, using its own-design "Home Energy Station".

A single, integrated unit that fits into a user's garage, the manufacturer's Home Energy Station makes use of solar power to generate hydrogen, enabling the user to refuel the vehicle at home. Engineered for an eight-hour, slow overnight refilling of a fuel-cell vehicle, the unit is designed to replenish sufficient hydrogen for a typical daily commute, or around 10,000 miles per year.

As a further inducement to going green, the system is also able to export electricity from its solar panels to the grid during the day, or whenever it is not in use refuelling a vehicle. With a "smart grid" system in operation, the user is thus able to sell electricity to the grid while remaining energy neutral. The unit employs a 48-panel, 6.0kW solar array, utilising thin-film solar cells composed of copper, indium, gallium and selenium.

While home refuelling is one solution, Honda has emphasised that construction of a public network of fast-fill hydrogen refuelling stations (with a five-minute fuelling time) is under way. However this network is limited to the southern California area at the moment, in order to give the pilot programme the best chance of a result.

COSTS AN ISSUE?

Honda claims that one of the reasons for the limited release of these cars is the small number of hydrogen-fuel stations available for refilling these cars. They do not quote the cost of manufacturing the FCX Clarity. Nor are they offering any of them for sale, which might suggest to the more sceptical among us that manufacturing costs may be a little too high for the market to bear.

Be that as it may, Honda is undoubtedly prepared to take on the investment risk in the interest of gaining a significant market and engineering lead in manufacturing hydrogen fuel-cell vehicles. Since industry experts and the European Commission are now pointing to the fuel-cell vehicle as one of the two most likely technologies for development in future road transport strategies, who is to say that they are wrong? ●

http://automobiles.honda.com/fcx-clarity

ECOFYS

Is a fully sustainable transport system feasible in forty years time?

In February 2011 WWF and Ecofys published "The Energy Report: 100% renewable energy by 2050", in which this question was answered in the affirmative. The Energy Report did not however say it would be easy. How did the authors arrive at this conclusion and what does it mean for managers and policy makers today?

The approach taken throughout the report was to:

- Strive for ambitious energy savings
- Use sustainable electricity wherever possible
- Meet the remaining energy demand with the limited biomass available

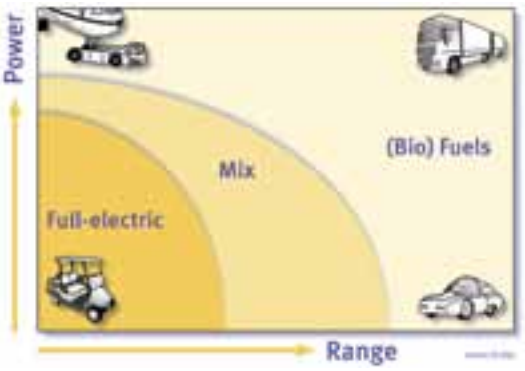

Figure 1 The use of electric vehicles and biofuels in road transport

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The Energy Report is available at www.ecofys.com/energyreport.

In terms of the transport system this means:

1. Greater use of public transport and a reduction in the distances people and goods travel
2. The electrification of mobility wherever possible, especially for short distances
3. The use of biofuels for longer distances, heavy goods vehicles, shipping and aviation.

For road transport, the viability of electrification (full-electric vehicles & plug-in hybrids) depends on the driving range of a vehicle and the required power. This is shown in Figure 1. Full-electric vehicles have a limited range, beyond which liquid or gaseous fuels will replace the battery or complement it (as is the case with plug-in hybrids or electric vehicles with range extenders). Above a certain required power/range combination, the internal power source is likely to remain a combustion engine.

For all vehicles that need to drive long distances, liquid biofuels are the most suitable source of power. For medium ranges, upgraded biogas could play an important role, as long as it is produced at competitive prices.

What does this imply for managers and policy makers wishing to embrace a sustainable scenario also for transport?

1. To achieve vehicle efficiency, electrification and compatibility with biofuels – as well as sufficient biofuel production – a robust and long-term policy is required. This needs to include both gradual changes, such as increasing the percentage of biofuels to encourage production, as well as creating an environment that is conducive to more disruptive innovations, such as long-term pilot projects in electric mobility.
2. Urban planners should maximize the potential of electrified urban transport and cycling infrastructure. The envisaged sustainable transport system includes a significant modal shift towards rail and other forms of public transport.
3. The report assumes strong growth of alternatives to automobility, such as public transport, cycling and teleworking. This will require a shift in the current perception of both automobility and travel, as well as a change in behaviour involving factors such as costs, time, comfort and status. For it is quite possible that most of the population today, that grew up with the current concept of mobility, will live to see 2050.

Driving the future car today – 2 The internal-combustion engine – not gone tomorrow

Philip Hunt

Only 40 years ago, most people had only two concerns about their car. How to make it more reliable and, for the enthusiast, how to give it more power.

The first fuel crisis of 1972 was still to come, and people who worried about fuel consumption bought motorcycles instead of cars. Atmospheric pollution was a concern only for the scientists.

Since that time, the internal-combustion (IC) engine has advanced so far and so fast that many consider it the breakthrough area of technology in mechanical engineering. Commentators from science-fiction writers to politicians have damned the IC engine as inefficient, out-of-date and polluting. Yet it remains the backbone of global transport systems because of its energy efficiency, and because improvements in recent years have changed the power plants of the 1970s almost beyond recognition.

CONTINUED INVESTMENT IN AUTOMOTIVE RESEARCH

European innovation in automotive engine technology over the last decades has been driven by two key concerns – the approaching end to fossil fuels as a resource, and growing concerns about the environment. As we look to the car of the future, the priorities are no longer performance and reliability, but safety, environmental protection and fuel efficiency.

In Europe alone, the EU invested approximately 1.7 billion euro into research on transport, clean engines and vehicle telematics between 1998 and 2002, while under the Sixth Framework Programme for Research (FP6) between 2002

Renault 1.5 dCi diesel engine

Vice-President of the European Commission Antonio Tajani aboard an electric car in Milan.

and 2006, the emphasis was on clean transport, safety and the intelligent vehicle. Over this time the automotive sector has benefited from a range of innovations in engine efficiency, energy use (alternative fuels), sustainable development (cleaner vehicles), and related research into intelligent materials, production methods and user preferences.

Two distinct approaches to engine development have emerged in that time, the petrol engine and the diesel. These two engine types, each with their proponents and detractors, have driven diverging market preferences in the global passenger-car market.

Development of both engine types over the last two decades has been driven largely by increasing regulatory controls, e.g. emissions, fuel quality, consumption, etc. Europe has developed a strong preference for diesel engines in cars, while the rest of the world has remained predominantly petrol-driven. In the commercial-vehicle sector, diesel engines are the accepted standard.

TO SPARK, OR TO COMPRESS?

Beginning in 1997, the flexibility introduced by the breakthrough technology of "common-rail injection" tipped the balance between the two engine types in favour of the diesel engine. Born within a European research project (NOFISDI), common-rail injection was taken up by Robert Bosch in 1997, and that same year both Mercedes Benz and Alfa Romeo launched cars equipped with the new system. Common-rail quickly became "the" fuel-efficient approach for diesel engines.

Yet petrol-engine technologies were not standing still. New approaches in particular around 2000 pushed the performance envelope for spark-ignition engines. Variable valve actuation (VVA) for the engine inlet valves became practicable, as did the concept of "downsizing" or gaining greater efficiency by using smaller yet more highly tuned engines.

With more power and greater engine flexibility, the future for petrol engines is now much more assured as a competitor for diesel. Thanks to such

developments, petrol remains the best solution for smaller vehicles where size, weight and cost are all-important considerations.

Exhaust-gas treatment systems are already fundamental to both petrol and diesel-driven vehicles in helping them meet emission-control regulations. The three-way catalyst was developed at the end of seventies for the petrol engine, while diesel-oxidation catalysts came in as early as 1989 for light-duty engines, and the diesel particulate filter in 2000.


Renault Fluenze Z.E battery-electric car

FUTURE IS HYBRID-SHAPED

Future Innovation in motive power for transport is likely to be driven by the need for increasing specialisation. Heavy-duty vehicles such as city buses or waste collection trucks for example, with their constant stop-start operations, will require different engine set-ups compared to the passenger-car if they are to meet tighter emission controls.

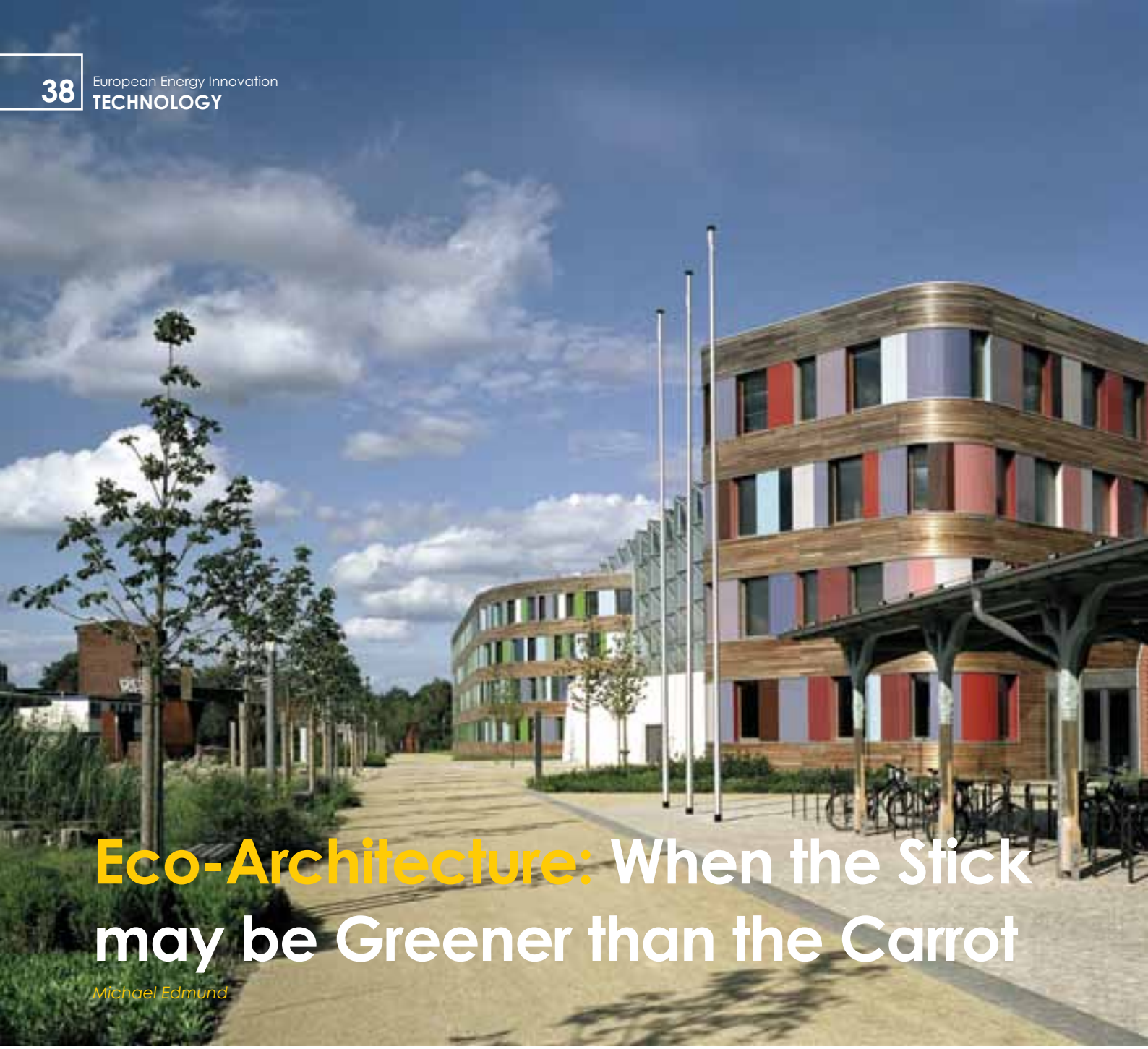
For the daily commuter, all-electric vehicles might at first appear to offer the best solution. But significant obstacles remain to the mass-market take-up of purely electric vehicles; the most important being driving range, battery recharge time, lifetime and cost of manufacture. For fuel-cell electric vehicles, the challenges include on-board hydrogen storage, distribution/fuelling networks, and again the cost of production.

In fact, some believe that the really emergent technology for the immediate future is the Hybrid vehicle. Combining the IC engine with electric drive enables designers to fully exploit the key characteristics of electric motors to simplify IC engine design and help meet fuel-consumption and emissions targets. The EU has been researching hybrid technologies for some time, note for example the HI-CEPS project in FP6. In future passenger-cars, the progressive introduction of electric drives and power electronics will play an increasingly significant role in meeting environmental concerns.

Depending on the class of the vehicle, more and more partial-hybrid cars will start to appear, with stop/start and brake-energy recuperation (the generation of electric energy as the car slows down instead of just wasting it as heat on the brakes), as larger mild and full hybrids steadily increase their pure electric range.

Yet the obstacles to any full replacement for the IC engine remain. Factors such as range, battery durability and recharge time, availability of hydrogen and on-board storage for fuel-cell vehicles all point to a lengthy transition phase for the traditional IC engine.

The most likely scenario is steadily increasing integration with hybrid components, up to the point of full electrification. Even then, a residual demand will remain around the world for vehicles with "go-anywhere" capabilities, which almost certainly means a continuing role for the internal-combustion engine.



Eco-Architecture: When the Stick may be Greener than the Carrot

Michael Edmund

On May 20th 2007, The New York Times published an article by its chief architecture critic Nicolai Ouroussoff, in which he sought to explain why the US lagged far behind Europe in the adoption of more ecological architecture. At the time, the average building in the U.S. used approximately one third more energy than its German counterpart, and as he contrasted more than a decade's worth of European Legislation with the lack of Federal Regulations, Ouroussoff suggested that Europe's more legislative stance had contributed to a climate in which green architecture was more a part of the landscape. Indeed, according to German architect Matthias Sauerbruch, both the concept and the application of eco-architecture have now developed far beyond the solar panels and turf roofs of the 1970s. In effect, a generation of European architects has grown up having to design buildings with sustainability in mind.

Two recent projects in Germany demonstrate how far this thinking has come. Designed by Sauerbruch Hutton, and completed in 2005, the Umweltbundesamt Dessau is claimed to be among the most efficient buildings in the world. It certainly demonstrates many advanced eco-architectural features, including district heating and air-to-earth cooling systems, photovoltaic electricity and a range of active and passive strategies to reduce energy consumption and carbon dioxide production, while the building's sinuous appearance has attracted

much positive comment and many visitors. But it is the choice of location for this project that is perhaps even more significant, for it is on the site of a former munitions factory, gasworks and industrial complex that had been heavily contaminated for decades. Rather neatly, a filthy site has been cleaned up to build an environmentally advanced building for a Federal Environment Agency. Another remarkable new building, for which a zero carbon footprint is claimed, has opened this year in Niestal, Germany. Designed by HHS

Architekten for SMA, this training facility includes a photovoltaic wall, integrated solar panels, a combined heat and power (CHP) system burning biogas, and a borehole heat exchange system which together make the building self sufficient in energy; it is not connected to the electricity grid.

On a different scale, the evolution of the eco-village at Findhorn in Scotland illustrates much of Sauerbruch's thinking. Findhorn began in the 1960s as little more than a caravan park, but today many individual buildings incorporate a range of advanced technologies, including triple glazing, super efficient insulation and a sophisticated district heating system. Many of these features have been retrofitted to existing structures within the eco-village, but Findhorn has also experimented over the decades with a variety of new construction and insulation materials.

The stronger presence of green building legislation in Europe may also be a contributory factor to the ready availability of information about green building. An ongoing study by Siemens has published the environmental credentials of 30 European cities, measured across 30 separate indicators including energy, CO2 emissions and the buildings themselves, while corresponding data from the US will not become available until later this year. The study showed that top-performing cities like Copenhagen (with an index of 87.31), Stockholm and Oslo (86.65 and 83.98, respectively) are two to three times greener than the worst-performing ones, Bucharest, Sofia and Kiev (indices in this study of 39.14, 36.85 and 32.33, respectively). One of the individual parameters examined was environmental governance, and Brussels, perhaps unsurprisingly, was the top-performing city in Europe.

Legislation may indeed have contributed to the progress of eco-architecture in Europe, but the recent Dutch experience with the introduction of Smart Metering has clearly shown the fundamental importance of consumer demand to the adoption of any green innovation. As Ouroussoff's article observed, eco-architects "cannot achieve anything without willing clients." ●

Green City Information by courtesy of Siemens AG, Munich, Germany and Economist Intelligence Unit, London, UK
Contact: Karen Stelzner, karen.stelzner@siemens.com

Sustainable building
From a Vision to Reality

The building and construction sector is of highest significance when addressing sustainability. The sector's relevance in terms of energy demand and associated impact on climate change is frequently being pointed out. The political agenda with its reduction targets for mainly energy demand and carbon emissions defines scenarios the construction and real estate sector must relate to. Meanwhile, the volume of new construction is a small figure compared to the existing building stock. Even if reducing the energy demand of new buildings to "near-zero", the influence on the overall building stock will not be fast enough to reach the political targets. Additional to building new sustainable buildings, the focus must be directed to operate, maintain and manage existing buildings in an optimized way. Single buildings are to be optimized including due consideration of their context within infrastructure and the urban environment. Life cycle performance optimisation must be applied not only for the life cycle of planned buildings, but throughout the life cycle of planned and existing buildings.

Therefore, innovation applicable to both new and existing buildings is sought. To be of high potential, an innovation must be applicable in a given context, support the building in its functionality and performance, and it must contribute to a development towards the desired targets. We offer services that assist our clients to identify and reach targets in terms of sustainability – through innovative concepts, management processes and the choice of technologies and products.

Sustainable building goes beyond new construction, beyond energy demand and beyond labelling. Sustainable buildings provide qualities in terms of environmental, economic, and socio-functional aspects. As an integrated, balanced approach that is reflecting the full life cycle, sustainable buildings provide value to all concerned parties.

In itself, sustainable building may be regarded as an innovation. It is seen as a highly

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significant future market, it is subject of one of the lead-market initiatives of the EU. At the same time, many of the cost-efficient carbon abatement technologies are related to buildings. As a result, the immense demand to improve the construction sector is to a very large extent cost efficient. A clear win-win-market.

Our services include product innovation project and management consultancy as well as economic, environmental and technical life cycle assessment. We integrate innovative approaches into existing business models for planning and management of buildings. With our services, buildings can be improved at their very heart.

Together with further partners, we have set up and conducted the EU funded SSA "Smart-ECO". In that project, a vision for sustainable building for the next 20-year period has been identified, and various innovations have been analysed as to their potential contribution to such a development. A stakeholder panel gave credibility to the approaches, findings and recommendations set out by the project partners. The core elements of the project were to (1) establish a vision for sustainable building (2) translate that vision into requirements (3) apply the requirements in terms of performance indicators in the evaluation of innovation (4) communicate the potential contribution of innovation towards the vision.

The approach and the findings of the Smart-ECO project are taken up by ISO standardisation work and by the UN-SUN program and the entire project was supported by CIB. More information can be found on **www.smart-eco.eu**

Mace advises on new and existing buildings design, legislation and building regulation, remediation-demolition-construction activities and processes, operation and occupancy.

Mace's full turnkey programme addresses and improves our clients' triple bottom line by reducing environmental footprint, enhancing compliance and improving profits.
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Ingenieurburo Trinius performs R&D and consultancy related to life cycle performance and sustainability of buildings and building products. Our core competence lies in economic and environmental life cycle assessment, product declarations and building labelling.
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Svenska Aerogel AB develops and markets custom designed aerogel-based materials for highly specialized functions. Focus areas include high performance insulation products and molecular filtration media for cleaning of air and liquids.
www.aerogel.se

Endoenergy Systems Ltd designs thermal energy systems based on integrating renewable energy technologies into buildings and is interested in developing new technologies for realising a supply chain based sustainable construction sector.
www.endoenergy.com

Towards better-informed energy consumption

An interview with Dr Howard Porter, Managing Director of ESMIG.

By Michael Edmund

Dr Howard Porter, Managing Director, ESMIG

Recent uncertainties in the energy markets have sharpened interest in the development of national and supra-national Smart Grids, while many Member States are adopting new smart metering technologies as part of their response. Dr. Porter explains the benefits they can expect, and some of the problems they face.

Q Good Afternoon, Dr Porter. Perhaps we may begin by asking you to explain a little about ESMIG: what it is, and in which areas of policy it is currently most active.

A ESMIG, the European Smart Metering Industry Group, is the body that represents manufacturers and suppliers right across the Smart Meter supply chain. Originally 10 strong, membership has now grown to 36, drawn from manufacturers of the meters and their electronics themselves, through the businesses involved in communications and data transmission, right up to the very information networks themselves. The organisation was conceived three years ago to support of the EU concept of installing a Smart Meter in every home across Europe.

Q What are the principal benefits of Smart Metering? Why does ESMIG feel that Smart Metering is assuming such importance?

A At the EU and national level, it comes down to the question of stability of energy supply. By steering activity towards greater availability of information across energy networks, Member States will be better placed to recognise potential limitations upon future energy supply; and better able to react to unforeseen political developments elsewhere. Smart Meters, once integrated into Smart Grids, will play an important role.

At the customer level, Smart Meters offer the prospect of using the greater availability of information to modify behaviour to reduce energy consumption, without necessarily affecting lifestyle.

At the Utility level, new Smart technology allows greater matching of demand and

supply, either through pricing decisions or, with appropriate consumer agreement, control of appliances remotely.

One particular example of the interaction between utilities and consumers is the potential growth in the use of electric vehicles, with consequent requirements for home charging; and pricing policies.

Q According to recent Directives, EU Member States must "ensure the implementation of intelligent metering systems." One of your main aims relates to the rollout of Smart Metering across Member States: how well do you feel this is progressing?

A Putting a Smart Meter in every house in the EU represents a huge undertaking, and it is perhaps not surprising that rollout is not an overnight phenomenon, especially when you see that the timescale for legislation at national level among most Member States is at least six to twelve months.

Q Do you ever feel frustration about the speed of adoption of Smart Metering across the different member states?

A In general, many member states have national policies in place and rollouts are occurring across the EU: things might be better, but they might also be much worse. Perhaps the biggest theoretical risk attached to significant delays in implementatiwon is that posed to financial backing of the newly emerging businesses.

Q What are your thoughts about the recent experience in Holland, where security concerns affected the rollout of Smart Meters?

A The Dutch experienced significant problems with their first attempt to make the adoption of Smart Meters compulsory. With due reference to the EU Measuring and Instruments Directive, the episode illustrates how important it is for such a project to proceed only with the full consent of fully informed consumers.

Q Is there any other pending EU Smart Metering legislation about which Member States should take notice?

A Not specifically. Perhaps the biggest issue is the convergence of different types of legislation, such as the relevance of building design upon energy consumption and micro-generation, which of course will be Smart Metered as the technology becomes more widely adopted.

Q What are your hopes for the forthcoming Sustainable Energy Week?

A We are proud to be a Partner of this event in April, and would be very pleased to welcome visitors to our presence there. We propose to publish the results of a survey of 135 Smart Meter rollouts, which promises to be very interesting for all those associated with the industry.

Dr. Porter, thank you for your time.

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Smart metering

Knowledge is Power (Francis Bacon)

In a previous issue we explored smart grids, a novel development that possess a number of advantages over the traditional power transmission system.

By Michael Edmund

At the heart of the smart grid is the smart meter, a unit that uses advanced measurement and management capabilities to record consumption in real time or near-real time; to monitor power outages and power quality (such as electrical current or gas pressure); and even to disconnect supply remotely. Other possible features include the detection of unauthorized use of electricity, changing the maximum amount of electricity that a customer can demand at any time; and remotely changing the supply tariff.

Many benefits are thought to arise from the adoption of smart meters; the most significant of these is an anticipated reduction in energy consumption. It is widely held that increased awareness among consumers of how much energy they are actually consuming is likely to affect their behaviour, and a typical response came from a member of the UK pilot smart metering scheme, who claimed that he had reduced his power consumption by 10% without affecting his lifestyle, simply through being more conscious of his energy use.

Another often-quoted feature

is that consumers will be able to buy more of their power when it is least expensive and less when it is costlier, with the effect of smoothing out demand, and therefore power generation and making the whole process more efficient. In the Republic of Ireland, one energy minister has even envisaged that smart meters would intelligently divert micro-generated renewable energy into plug-in hybrid cars, effectively making them power storage devices.

A SMART METER FOR EVERY HOME IN EUROPE?

According to business intelligence company Berg Insight, there were about 39 million Smart Meters in use across Europe at the end of 2008; and at least five member countries have ambitious plans for 100% conversion to smart metering. Leading the way is Italy, where, between 2000 and 2005, the dominant utility supplied smart meters to its entire customer base of over 27 million consumers. In December 2009, the United Kingdom announced its intention to have smart meters in all homes by 2020, at an estimated cost of £7/€8.3 Billion. Some of this will be borne by the utility companies, the rest by consumers.

In France a smart metering pilot project involving 300,000 customers in the Indre-et-Loire département and the Lyon conurbation is the precursor to national deployment for 35 million consumers, scheduled to start in 2012. Elsewhere, a pledge was made in 2007 to introduce smart meters for every home in the Republic of Ireland within a five-year period.

BUT NOT UNMITIGATED JOY

There has been a certain amount of controversy attached to the introduction of smart meters. This particularly concerns the data they collect, and who owns it. In the Netherlands, a policy of mandatory rollout was revised in 2009 to make uptake voluntary. This came after consumer groups raised privacy concerns: the principal argument was that accurate and continuous monitoring of power use might suggest when a property is habitually unoccupied, which might in turn pose security issues.

There have been other difficulties of a technical nature, principally concerning the registering of small-scale local energy production (such as by domestic solar panels), and the impact of advances in smart meter technology.

Francis Bacon may not have been writing about electricity in 1597, but it is clear that the twin threats posed by climate change and dwindling fossil fuel reserves are driving the need to know more and more about the power we use.

Zero Carbon Britain 2030 Feasible target or pie in the sky?

Philip Hunt

The Copenhagen Climate Conference, despite the negative headlines that resulted, achieved at least one positive outcome – a near universal consensus for limiting the maximum rise in global average temperatures from pre-industrial values to no more than 2 degrees C. Yet in the UK for example, reaching such a target would mean cutting carbon emissions by almost 100% by 2030. Is this a feasible target, or pie in the sky?

The Centre for Alternative Technology, or CAT, in Wales says that it is achievable. According to its report "Zero Carbon Britain 2030", a 90% reduction in carbon emissions is feasible by 2030, together with a "carbon capture" equivalent to the remaining 10 per cent. This heavyweight document (384 pages) gathers eminent climate-change scientists and researchers to offer an integrated route map for addressing carbon emissions from a UK perspective.

POWERING DOWN HIGH-CARBON LIVING

For the UK, according to CAT Director Paul Allen, taking this kind of lead is essential if other countries are to agree to the same. "The barrier to the global agreement we urgently need – is that the offer from the long industrialised countries which have created 80% of the problem is simply not enough to gain agreement from the majority world."

The proposals in the report focus on "powering down" high-carbon living by reducing energy demand, so easing the transition to fossil-free supply. New technologies and more efficient design are evaluated as an essential part of the decarbonisation strategy.

Offshore wind and wave energy are identified as having the strongest potential in the UK for renewable energy (the UK holds 40% of the EU's total wind resource, but only 4.2% of total installed capacity - Lambert, 2008), and the report suggests that they could provide most of the fossil-fuel free energy mix by 2030.

Zero Carbon Britain 2030 also deals with some of the cost criticisms of small-scale renewables and microgrids. It admits that while such smaller-scale technologies will be relatively more expensive, it picks out the often-forgotten issue of transmission losses from large central power-generating facilities, and suggests that microgrids can go some way to assist in minimising such losses and helping to manage distributed generation.

Interestingly, in the electric versus hydrogen fuel-cell debate for powering road vehicles, the report comes down firmly on the side of the all electric car. While it admits that hydrogen can store more energy for less weight than batteries, and can be created from zero-carbon electricity using electrolysis, the process requires twice the energy of using batteries. It therefore suggests electricity as the preferred power source for cars, while hydrogen is better suited for transport applications where large amounts of power are required for starting or stopping, i.e. buses or heavy freight.

BUT DRASTIC POLICY INTERVENTIONS REQUIRED

The authors admit that meeting such an ambitious target will require more than just exploiting

Centre for Alternative Technology
Canolfan y Dechnoleg Amgen


A wind turbine blade on route to installation.

green technologies. Drastic policy interventions at both national and international level will be required, they say, causing real pain in terms of freedom to exploit resources. For example, a one-third reduction in international flights is suggested, as well as a complete halt to domestic flights.

The report recognises therefore the importance of educating consumers on the need to change their energy use.

Public education, it believes, is essential if such radical changes in consumer behaviour are to be brought about, and it recommends policy changes and communication campaigns as a way of strengthening our receptivity to change.

PIE IN THE SKY?

Zero Carbon Britain 2030 has drawn criticism from some sources. Yet it does have a large number of eminent names behind it, as well as the support of organisations like the E3 Foundation, the Met Office, and the Universities of East Anglia, Strathclyde, Wolverhampton, De Montfort and Edinburgh Napier.

"In calling for a common sense of purpose, not just nationally but internationally too, [the report] points out the benefits for society, its health, social welfare and sustainability, that will result from the pursuit of such a goal. May I urge you to study carefully its arguments and its findings." Sir John Houghton, former Co-Chair of the Intergovernmental Panel on Climate Change.

CAT has presented Zero Carbon Britain 2030 as a roadshow to the Catalan Institute of Engineers, hosted the 2010 Schumacher Society conference on the same theme, and presented it at the European Parliament in Brussels. It can be purchased by accessing the dedicated website to the left.

Zero Carbon Britain 2030
www.zerocarbonbritain.org

Centre for Alternative Technology (CAT)
www.cat.org.uk

Sunshine in the fuel tank?

By Michael Edmund

Sometime around 2,700 million years ago, life on Earth first performed the feat of using sunlight to power the creation of its own energy source. Now, scientists at the California Institute of Technology (Caltech) have shown that it is possible to pluck the basic constituents of liquid fuels such as gasoline out of the air around us. Using only heat, carbon dioxide, water and the peculiar properties of a compound called cerium oxide (ceria), the team has shown that it is possible to produce a reliable stream of the gases carbon monoxide and hydrogen. Two things make this development exciting: the first is that for the last eighty years, we have had the technology to manufacture synthetic fuels from a mixture of these gases. The second is that the heat required for the process comes from nothing more than focused sunlight. Not from burning fossil fuels, with important consequences for our carbon footprint and our effect upon the climate.

At the heart of this new process is the observation that ceria gives off oxygen when it is heated sufficiently; and that this hot, oxygen-deficient ceria is able to regenerate itself as it cools by extracting oxygen from a suitable source.

The Caltech team has devised a means of using focused sunlight in a two-phase cycle to provide the necessary heat. In the first phase, ceria was heated to around 1500°C to remove its oxygen. During the second phase, it was allowed to cool to around 900°C and exposed to either carbon dioxide gas, CO_2, or to water, H_2O (again as a gas). In both cases, the ceria extracted oxygen, producing, respectively, carbon monoxide, CO, or hydrogen, H_2. Importantly, the team were also able to demonstrate that stable production of these gases over 500 cycles, offering a realistic basis for a continuous production technology.

Fischer and Tropf, two German scientists working in the 1920s, discovered how to convert a mixture of hydrogen and carbon monoxide gases into liquid hydrocarbons – or, in other words, into fuels. Modern applications of the process now bearing their names (Figure 2) now permit us to control the nature of the fuels it produces, which may now be realistically thought of as stored sunlight.

However, there remain many obstacles to overcome before we can reliably manufacture all our fuel from nothing more than air, water and sunlight. Perhaps the biggest of these is the fact that Caltech team achieved less than 1% efficiency for the process, principally because the relatively small scale of the experiment resulted in relatively rapid heat loss. However, they remain confident that near 20% efficiency can be achieved in an industrial scale plant. Man's most recent research activities may therefore mean that he will soon be able to counter the twin threats of diminishing fossil fuel reserves and climate change - by imitating the trick that has been performed by plants and algae for millions of years.

News

Choose your green vehicle

The European Commission has launched a new website to help organisations and individuals choose the cleanest and most energy-efficient vehicles for their needs. The new Clean Vehicle web portal supports a European directive that requires from January 2011 all purchases of vehicles for public transport services take into account energy consumption, CO2 emissions and pollutant emissions. The most obvious attraction is to commercial fleet users, as the portal focuses on lifetime cost calculations.

More information:
www.cleanvehicle.eu

NER300 – major EU investment into low-carbon technologies

The European Commission launched in November 2010 the first call for proposals for the world's largest programme of investment in renewable energy and low carbon demonstration projects. The initiative, known as NER300, will provide substantial financial support for at least 34 projects involving innovative renewable energy technologies, and at least eight projects involving carbon capture and storage (CCS) technologies.

The aim is to drive low-carbon economic development in Europe, creating 'green' jobs and contributing to the achievement of the EU's ambitious climate-change goals. The European Investment Bank is collaborating with the Commission in the implementation of the programme.

Climate Action Commissioner Connie Hedegaard said: "The NER300 is a good example that together, EU 27 can do more than we can individually. Through using revenues from selling of CO2 allowances, around €4.5 billion will be available for innovative renewable energy technologies and CCS. With project sponsors and Member States contributions this will sum up to €9 billion."

Funding is aimed at demonstration projects involving innovative renewable-energy technologies and CCS. At least one project, and a maximum of three, will be funded per member state. The initiative will fund up to 50% of the construction and operating costs of the projects, leveraging a total investment of more than €9 billion.

NER300 funding can be combined with financing from other EU instruments, including the Structural and Cohesion Funds and the European Energy Programme for Recovery (EEPR).

Public consultation on "Europe 2020 Project Bonds" to fund infrastructure

The European Commission has launched a public consultation on the "Europe 2020 Project Bond Initiative", which aims to boost funding for projects with long-term revenue potential that meet the Europe 2020 policy priorities. The initiative aims to help private companies attract capital market funding from investors such as pension funds and insurance companies.

European Commissioner for Economic and Monetary Affairs Olli Rehn said at the launch, "Financial instruments should play a larger role in the funding of public-interest projects. Today public budgets are in need of consolidation. But at the same time, we need to promote sustainable growth in Europe. EU budget resources must be used more effectively so that such projects attract capital market financing. This is why we are joining forces with the European Investment Bank in this Project Bond Initiative."

European Investment Bank President Philippe Maystadt said, "Infrastructure finance in Europe has suffered since the financial crisis and banks face new constraints on long-term lending. Project bonds could be a way to attract capital from other investors, such as pension funds and insurance companies, and be a useful addition to traditional financing options."

For transport alone, assessment of member states' investment plans reveals that around €21.5 billion per year is needed in the post-2013 period to remove significant bottlenecks, construct missing cross-border links, and interconnect transport modes. The consultation closes on the 2nd May 2011.

Aquasun – floating solar panels

Most solar energy systems on the market today bear several major weaknesses: they require large areas of land in order to be built, cooling may be required for cells that get very hot, and the costs for solar-cell fabrication and maintenance are high. A new technology is set to overcome some of these challenges – floating solar power plants.

This innovative solar-power technology has been developed under the EU EUREKA programme, by a partnership between EDF of France and Solaris Synergy from Israel. Fabrication of a prototype began after design finished at the end of March 2010, and the team is now aiming to launch the implementation phase in September 2011.

The tests will take place at Cadarache in the South East of France, the site having a privileged position on the French electric grid and being close to a local hydro-electric facility providing the water surface to be used. The prototype will operate on-site for a period of nine months, during which system performance and productivity will be assessed. The research team believes that by June 2012 they will be ready to launch the technology on the market.

A key benefit of the "water cooling" is that the photovoltaic system can make use of silicon solar cells which, although cheaper to manufacture, tend to experience overheating problems in normal land applications and need to be cooled down. The water basins on which the plants would be built are not natural reserves, tourists' resorts or open sea; rather they are industrial water basins already in use for other purposes. Such floating solar plants should therefore have a minimal impact on natural landscapes.

"It's a win-win situation", declares Dr Elyakim Kassel, coordinator of the AQUASUN project and business development manager at Solaris Synergy. "There are many water reservoirs with energy, industrial or agricultural uses that are open for energy production use".

Something to say?

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

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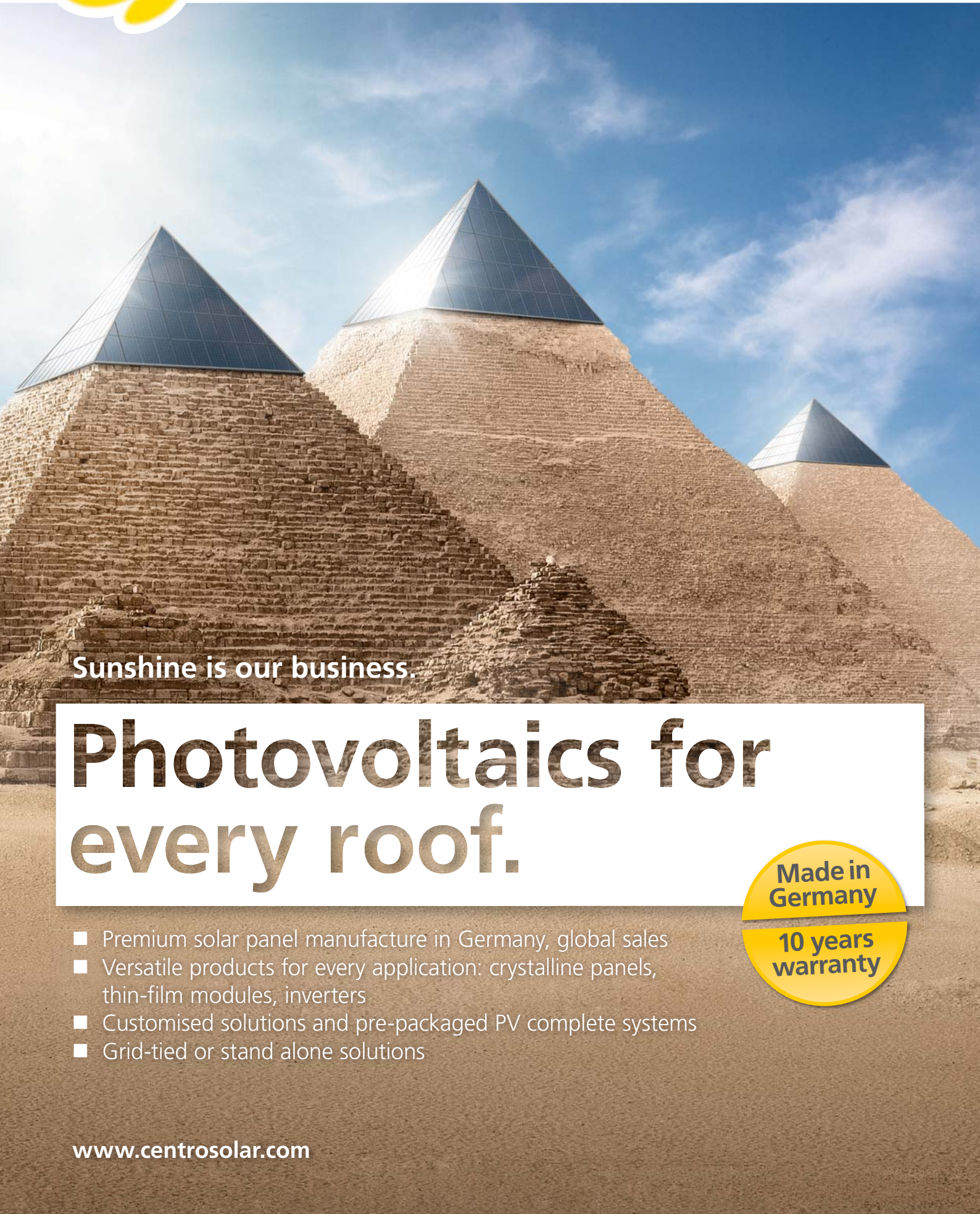

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