SUMMER 2012

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Secure our future: towards a European Energy Strategy

Bioenergy

Austria

Safe Nuclear Energy

Included with this issue – LEDs under the lens: a special LED lighting supplement

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Bank Chambers
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Tel:+44 20 8786 3695
Sales office +44 1372 726135
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Brussels representative office
145/15 Avenue Molière
B-1190 – Brussels
Belgium
Tel: + 32 2 347 70 19

To obtain additional copies please email info@europeanenergyinnovation.eu

PUBLISHER
Graham Pendred

EDITOR
Michael Edmund

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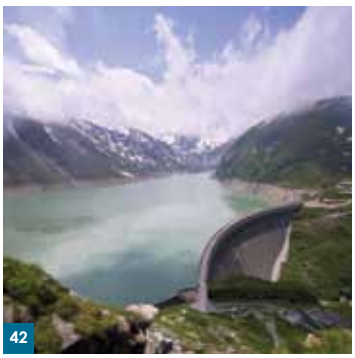
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VOITH
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Foreword

Europe is confronted by pressing problems: it is far from certain whether Greece will trade next year in the euro or the drachma; meanwhile Bankia in Spain appears now to require a huge injection of capital. And there is a new occupant of the Elysée, apparently with a new mandate to re-examine the prevailing approach to economic austerity. That promises to be an interesting debate.

If only it were as simple as pressing a button marked "Growth".

And the climate will not wait for Europe to solve its problems. It will continue to change; according to the OECD, the world's population will grow, demand for energy will grow, emissions will rise and the environment will deteriorate. Europe clearly needs to continue vigorously to pursue its 20-20-20 objectives - and there is even a case for strengthening them.

If only it were as simple as pressing another button marked "Green Energy".

The need for an energy strategy is as great as ever, and in this issue Commissioner Oettinger presents the second of two articles. In it, he illustrates his commitment to producing the Energy Roadmap 2050, and explores the five principles upon which Europe-wide action should be taken. These naturally include energy savings, but they represent a commitment to energy systems that are more secure, sustainable and competitive – with clear benefits for European citizens. Director General Lowe enters the great post-Fukushima debate about the safety of nuclear power, even as preliminary WHO data shed light upon the health implications – or the lack of them - of the devastation of the Japanese facility.

Our country focus features Austria, a country with excellent environmental and renewable credentials. An article by Nikolaus Berlakovich, her Minister of Agriculture, Forestry, Environment and Water Management shows how it may be possible to reconcile green initiatives and employment, while Minister for Economy and Energy Dr Reinhold Mitterlehner explains legislative and financial aspects behind Austria's green revolution, emphasising the importance of new smart technologies. Elsewhere, articles on district heating systems show their potential role in Smart cities, and we explore the potential for LEDs to reduce Europe's lighting bill. We learn that Güssing in Austria is 100% independent of fossil fuels and we ask a pretty fundamental question about whether we can we afford to continue to develop this resource, or whether can we afford not to do so.

Oh, if only it were that simple.

...and there is a lot more for you to read inside.

Michael Edmund
Editor

Secure our future Towards a European energy strategy

Günther H. Oettinger, European Commissioner for Energy

Energy is the lifeblood of our society. Our way of life is inconceivable without reliable and affordable supplies of energy: electricity, heat and fuel. Never before has the world needed so much energy: we use almost twice as much as in 1980. If this trend continues, it will be difficult to avoid a major energy crisis, with electricity cuts, petrol or gas shortages.

WE CANNOT AFFORD TO WAIT

The energy challenges are among the greatest tests which Europe has to face. Our economic competitiveness fully depends on a reliable energy supply and the physical availability of energy products and services at the most affordable price. We must also act now to prevent global warming. Simultaneously, there is increasing competition at world level, with emerging powers like India or China demanding a larger share of the world's energy resources… and investing hugely in new energy technologies. Growing EU dependence on imports from third countries is also a matter of great concern, in particular for oil (85 %) and gas (65 %). All these challenges must be addressed and require strong action. The economic recession, the lack of a proper global climate change agreement, fast growing demand for energy in developing countries and the relatively high price of renewable energy technology make our task more difficult.

Over the next 20 years, we need to invest around one trillion Euro in energy, whatever happens. If we invest this wisely, we can develop new energy sources, expand supply networks, boost renewable energy use and cut energy consumption significantly. But this requires bold decisions now.

A NEW STRATEGY FOR THE NEXT DECADE

Therefore the European Commission is proposing an ambitious strategy for the coming years which will give real backbone to the single European energy market and "Europeanise" energy policies across the EU. National policies are not sufficient anymore to allow a strong economic recovery

and maintain our welfare. Any decision taken by one Member State has an impact on the others. Fragmented markets undermine the security of supply and limit the benefits of a fair competition while our investments for the future will only be profitable and efficient within a continental market. There will be no miracles. We must promote a common energy policy serving our joint policy objectives: competitiveness, sustainability and security of supply.

I see 5 pillars for action to the benefit of all Member States and citizens.

FOCUS ON ENERGY SAVINGS

First, there is a vast amount of untapped potential to save energy, which would save money for individuals and businesses alike. Faced with commitments to reduce drastically our emissions and achieve the objective to increase energy efficiency by 20% by 2020, action on energy demand has the most potential with immediate impact for saving energy, reducing waste and maintaining our competitiveness. Estimates show that average energy savings for a household can amount to €1000 per year. To achieve this, we must develop the best ways to save energy and use energy more efficiently, and we must put in place effective tools. To this end, the Commission has proposed this year a new Energy Efficiency Action Plan and the Energy Savings Directive to clarify the energy savings objective and identify innovative solutions for immediate and long-term action, notably in buildings and transport. As a matter of priority we should focus on public authorities who can lead by example and apply energy efficiency criteria in all public procurement of works, services or products.

A STRONGLY INTEGRATED EUROPEAN ENERGY SINGLE MARKET

The energy single market must be fully integrated. A European market offers the right scale to assure access to resources and to justify the huge investments which are needed. We should no longer tolerate barriers which impede energy flow within the EU. National borders can threaten the benefits of the Single Market, the competitiveness of our industry and the supply of basic needs to all our citizens. Fair competition, quality of service and free access must be guaranteed. The full and proper application of EU legislation is a must. But the existence of the adequate infrastructure is a condition sine qua non. It is time energy is given comparable pan-European infrastructure, as other sectors of public interest such as telecommunication and transport have enjoyed for a long time: by 2015, no Member State should be isolated from the European internal market in energy supply. This means that we have to concentrate our efforts on concrete projects necessary to achieve our goals: solidarity, an inter-connected market, new power capacities, an "intelligent grid" and large scale production of renewable available to all at competitive prices. We also need to build new import pipelines - such as Nabucco - to diversify and strengthen our gas supply. The EU has a vital role to play to ensure that these investments take place and create the needed leverage to make the investments more attractive.

CITIZEN'S FIRST

These efforts should always focus on the impact on citizens. Consumers should benefit from wider choice and take advantage of new opportunities. Energy policies have to be more consumer-friendly and this will require further transparency and information: I would like all tools, like the Consumer Check List, to be improved and applied more widely. This also implies that all consumers enjoy their right to basic energy needs at all times, including in a supply crisis.

EU energy policy also aims to achieve more transparency, access to better and more information, better functioning of the retail market, development of adequate infrastructure and safety nets for vulnerable consumers. This is in addition to constant efforts for more safety and security in energy

Günther H. Oettinger, European Commissioner for Energy

production and processing. Today, the EU represents a decisive added-value for all citizens by ensuring that the highest standards are applied in all Member States for nuclear safety and security, offshore oil and gas extraction or the development of new energy technologies. We must keep on track and continue to be vigilant.

TOWARDS A TECHNOLOGICAL SHIFT

In energy technology, we must consolidate and extend Europe's lead. I would like to develop a European reference framework in which Member States and regions can maximise their efforts to accelerate market uptake of technologies. Europe has some of the world's best renewable energy companies and research institutions: we need to keep this leadership. Beyond the implementation of the Strategic Energy Technology Plan, we have already launched a few large scale projects with strong European added-value:

- smart grids to link the whole electricity grid system to individual households and give better access to renewable sources of energy,
- the 'smart cities' innovation partnership to promote throughout Europe integrated energy systems at local level and facilitate energy savings.

STRENGTHENING THE EU LEADERSHIP IN THE WORLD

The EU should be a favoured partner in international negotiations. The present situation, where external partners can "divide and rule", is untenable. The EU has the world's largest regional energy market – 500 million people. It accounts for one fifth of the world's energy use.

We import on average around 3 million tonnes of oil equivalent every day. The EU is also the world's biggest economic trading block. We must exploit our geopolitical weight in the world and enjoy the benefits of the Single Market. Every time that the EU has spoken with one voice, for instance in the nuclear international cooperation, it led to results. Europe needs a mechanism to coordinate its efforts and send coherent messages to our main partners. The integration of energy markets with our neighbours is a must which contributes to both our, and their, security. But our international relations must go further and should aim at establishing strategic partnerships with key partners. A common European policy is a strong leverage to strengthen our position in difficult negotiations and secure our international leadership.

TIME FOR ACTION

The global energy system is entering a phase of rapid transition with potentially far-reaching implications for the next decades. The time for action is now. Our 5 pillars strategy paves the way for success in the coming years.

I will continue to present a number of new European initiatives to deliver our 2020 energy targets and to make our energy systems more secure, sustainable and competitive. And I will come up with our Energy Roadmap 2050 by the end of the year. The winners will be our citizens and our weight in the world. As Jean Monnet said: "Where there is no vision, people perish". Our generation must take the opportunity to make of this strategic vision a reality.

RAG – exploration, production and storage

RAG is Austria's oldest exploration and production company. Since its formation over 75 years ago, RAG has produced over 15 million tonnes (mn t) of crude oil and 24 billion cubic metres (cu m) of natural gas. Its core lines of business are oil and gas exploration and production and gas storage. Today, the company's 400-strong workforce produces some 600mn cu m of natural gas and 140,000 t of crude oil per year. RAG has exploration and production assets in Austria, Germany, Hungary, Poland and Ukraine.

RAG STORAGE FACILITIES STRENGTHENING EUROPE'S ENERGY SUPPLY SECURITY

Storage facilities are central to affordable and secure natural gas supplies for Europe. RAG is one of Europe's leading gas storage operators, and now operates around 5 billion cu m of storage capacity and a maximum withdrawal capacity of 2.3 mn cu m/hour from its Haidach, 7Fields and Puchkirchen storage facilities. The company developed the Haidach gas storage facility – the second-largest in Central Europe – and the 7Fields facility in cooperation with Wingas, Gazprom and E.ON.

In step with the development of renewable energy sources the importance of gas and gas storage is increasing in Europe. Gas storage is the ideal partner for renewables. It ensures that power energy is available when the sun goes in or the wind stops blowing. As a result, RAG's storage assets play a key role in security of supply in Central Europe. State of the art technology underpins the flexibility and high safety standards of RAG's storage facilities.

GAS – THE ENERGY SOURCE OF THE FUTURE

Gas is a true all-rounder, and its versatility means that it will remain an indispensable part of the energy mix. Huge gas reserves exist around the world, and gas is easy to store, environmentally friendly and efficient. It can be transported out of sight, underground throughout Europe, using safe infrastructure that is already in place.

It also offers a lot of potential for innovation. Cutting edge "power to gas" technology is capable of converting unused wind and solar energy into gas via methanation.

Large quantities of gas produced in this way could be fed into the European gas grid and held in gas storage facilities, transforming the latter into energy storehouses. Constantly available wind and solar energy regardless of weather conditions? Gas can turn this dream into reality.

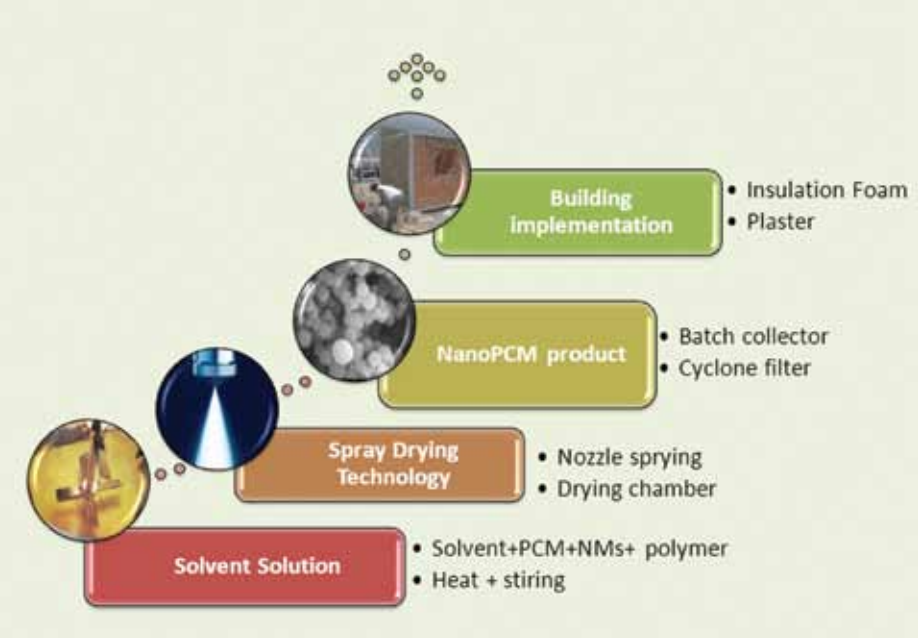
Thus RAG's strategy is based on the conviction that gas is the energy of choice for the future in Europe.

Contact details:
RAG Rohöl-Aufsuchungs Aktiengesellschaft
Schwarzenbergplatz 16, A-1015 Wien
Tel: +43 (0) 50724 5448
Mobil: +43 (664) 614 8010
www.rag-austria.at
eMail: elisabeth.kolm@rag-austria.at

NANOPCM
New Advanced Insulation Phase Change Materials

NANOPCM project "New Advanced Insulation Phase Change Materials" is one out of 6 funded proposals in the FP7-2010-NMP-EeB call launched by E2B-PPP initiative. The Energy Efficient Buildings European Initiative (E2B EI) was set up by the European Construction Technology Platform (ECTP) to help the construction industry address climate change, reach the European Commission-set 2020 targets and achieve energy-neutral buildings and districts by 2050.

More than the 40% of final energy consumption in the European Union member states comes from the buildings sector and the 57% of this energy is used to space heating and cooling[1]. Thermal insulation is one of the key solutions in reducing energy consumption. The NANOPCM project came to give a new innovative and high technical solution to increase the thermal inertia of the buildings envelope without increasing mass neither space in a cost effective way. Through the incorporation of the proposed Phase Change Materials (PCMs) technology improved with the use of nanomaterials, the new building envelopes will be provided with an extra thermal storage capacity based on latent heat. It means an increase of the thermal resistance of light insulation materials, reducing the overall energy consumption and increasing the thermal comfort of the end user.



Pilot plant process and final applications

The increase in the level of greenhouse emissions and the increase in fuel prices, support efforts to look for a more effective use of renewable energy sources. Solar thermal energy is considered to be one of the most promising energy sources but some technical improvements must be done due to the fact that solar radiation is a time dependent parameter. For this reason, thermal energy storage plays a crucial role to take advantage of solar radiation in buildings. Latent heat thermal energy storage via phase change materials is particularly attractive due to its ability to provide high-energy storage density. Unfortunately, prior to the large scale application of this technology, it is necessary to resolve several drawbacks at the research and development stage and also to reduce cost for massive applications.
The project focus on development and manufacturing of nanotechnology based PCMs and its integration into smart insulation materials with enhanced thermal and mechanical properties. Overall production costs will be reduced making wide

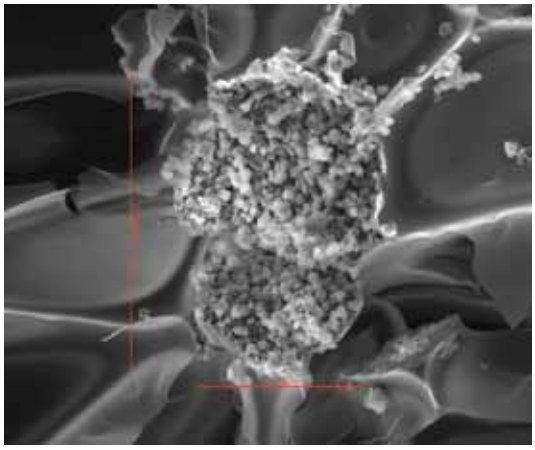
scale commercial applications feasible by means of a pilot plant production and its implementation at real scale

The overall objective of the project is the development, implementation, production and demonstration of low cost and improved Phase Change Materials (PCMs) for new high performance insulation components in existing buildings.
The combination of PCMs technology with nano-scale components is solving most of the inconvenient derived to the use of PCM. On one side, the introduction of PCM in different nanoporous matrices to hold the PCM has been proven to avoid leakage, sweated and losses, and will improve the holding, miscibility and their future application, avoiding microencapsulation and reducing the cost. On the other side the using of thermal conductive nanomaterials has been proven to improve the thermal transfer behaviour of the PCM avoiding supercooling and consequently the better efficiency of the final material.

Other technological innovation has been already achieved: the demonstration of production viability of developed materials at pilot plant scale. With this scale up, enough material will be produced to implement the technology in a small house and get the real results of the new technology performance. The construction of the pilot plant entails all the needed steps for an engineering process: balances, preliminary design, detail design, auxiliary equipment requirement, materials characteristics…..All these tasks convert this project in a complete process in the development chain of new products.

NANOPCM will have a significant financial and technological impact on Industrial Insulation sector of EU as well as on EU Construction, Manufacturing and Material sectors. The European energy consumption in 2012 was predicted to be 2067 Mtoe and a total of 500 Mtoe will be used in building space heating[2]. Using current insulation systems, the 42% of the energy could be saved. That means 210 Mtoe every year. If the improvements proposed in NANOPCM project are applied, the total savings could rise to 330 Mtoe/year (24% extra obtained in preliminary tests). The use of smart thermal insulation with storage capacity in building walls carried out by NANOPCM consortium contributes to reduce the energy consumption and the annual energy cost for end-users.

A cluster has been created with all involved projects in the same FP7-NMP-EeB call and common activities are being developed. One of them is the construction of two Technology Demo Parks in Spain and Poland, where developed insulation materials prototypes will be tested at real scale. This activity will be used to share technologies and compare energy efficiency behaviours and to improve the interaction between projects and R&D results.



PCM microcapsules inside insulation foam

Contact: José Cubillo Capuz
Telephone: +34 91 791 20 20
jcubillo@acciona.es
NANOPCM Project
www.nanopcm.eu

1. Poel, B., et al. Energy performance assessment of existing dwellings. Energy and Building 39 (2007)
2. US. Energy Information Administration (EIA). International Energy Outlook 2011

Bioenergy markets in the EU How Intelligent Energy-Europe is contributing

Silvia Vivarelli, Dario Dubolino and Emilio Font de Mora, project officers, Intelligent Energy – Europe programme, EACI

Bioenergy will play a crucial role in the achievement of the 2020 targets: it currently provides more than 2/3 of the renewable energy in the EU, and is expected to account for more than half the EU's renewable energy in 2020 and for about 11% of the total EU energy consumption, according to the Member States' National Renewable Energy Action Plans (NREAPs).

The Intelligent Energy-Europe (IEE) programme, the main EU instrument to boost market development of well proven technologies for sustainable energy, has been supporting the bioenergy sector through a number of projects. It has helped the development of supply chains for solid biomass, liquid biofuels and biogas, and it has provided important inputs to the elaboration of European, national and regional strategies with an increasing focus on the most sustainable and efficient use of the available bio-resources.

IEE projects have successfully attracted foresters, farmers and related associations from all over Europe to implement local biomass-to-energy supply chains, which are key to foster domestic bioenergy production. Investments in wood-based heat generation from undermanaged woodlands in the UK, Croatia and Slovenia have been facilitated by the Woodheat Solutions project, which involved more than 1400 market players in training activities and organised study tours to Finland and Austria for 144 of them. As a result of the project activities, 1900 ha of forests in the UK, 1100 ha in Slovenia and 650 ha in Croatia are subject to negotiations for long term heat supply and there are plans to install 12 MW of new woodheat capacity in the UK, 1 MW in Slovenia and 2.6 MW in Croatia. The organisation of regional markets for wood fuels has been supported by the BiomassTradeCentres project. More than 1300 market players were trained and more than 7000 took part in demonstration events, resulting in 7 new Biomass Logistic and Trade Centres (BLTC) in operation at the end of the project, with 22600 t/y of wood fuels traded and 16100 tons CO_2eq/year saved; 17 more BLTCs are expected to start operation in the short term. Another IEE project, Bio-Methane Regions, will accompany 20 biogas and biomethane plants from the first project idea to the realisation of the infrastructure, with an expected impact quantified as more than €50 million investment mobilised and more than 25000 toe/year biogas produced. It is based on the successful Biogas Regions project, which mobilised more than €40 million investment in new biogas plants in 7 regions, leading to savings of 60000 tons CO_2eq/year.

Trade barriers are still a crucial issue to be solved for the development of a mature bioenergy market. In order to boost international biomass fuel trade, the Eubionet III project has helped Eurostat in the development of Combined Nomenclature codes for wood pellets and it has successfully contributed to the development of price indexes for industrial wood pellets and wood chips and of the CEN standards for solid biofuels. The implementation of these CEN standards will be supported by the SolidStandards project through training events for 700 industry players in 11 countries and through standards implementation in selected companies. The PellCert project will support the development of a European certification system for pellets (ENplus) and

its implementation in Austria, Germany, Spain, Italy and Finland. The project is expected to result in more than 20% of pellet production in these countries being certified, and in the development of procedures to certify the sustainability of pellet production and trade.

A number of IEE projects have contributed to the elaboration and implementation of EU and national policies. The Biomass Futures project has provided EU policy makers with quantitative information on the role that sustainable biomass can play to meet the 2020 targets, while SolidStandards and PellCert have provided inputs to the debate at EU level on sustainability criteria for solid and gaseous biofuels. The Biograce project is helping national governments across the EU to take a common approach in the calculation of GHG savings from biofuels, in line with the RES Directive; this will in turn ensure a level playing field and greater certainty for the biofuels sector. So far, four Member States have made reference to the BioGrace standard values in their respective legislation and/or technical guidance, four more are already committed to do the same, and others are expected to do so in the future. The BAP Driver project developed guidelines for the development and monitoring of national biomass plans and promoted exchanges of ideas and know-how between national administrations; five EU Member States used the project results to set up the bioenergy part of their NREAPs.

Top: wood pellets. Bellow: biogas plant

For further information on the IEE programme and projects please consult ec.europa.eu/energy/intelligent

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Virginia Willis
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E: exhibitree@pennwell.com

Latin America, Spain and Portugal:
Juan Gimenez
T: +54 11 4787 3817
E: exhibitree@pennwell.com

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Biogas and anammox: a green wedding

Anaerobic digestion and biogas production is a leading and well known bio-energy technology, capable to deal with a wide range of substrates and to provide electrical and thermal energy and biofuels as biomethane.

In the Po Valley (Italy), as well as in other regions in Europe devoted to agriculture and intensive animal farming, large amounts of organic residues and biomasses are available that could sustain considerable anaerobic biogas production. However, the need to cope with the limit on nitrogen application on soils imposed by the Nitrate Directive to protect water and groundwater is frequently a bottleneck in the implementation of anaerobic digestion.

This has stimulated the search for cost-effective and environmentally sustainable nitrogen removal techniques.

The BRAIN project, from an Italian acronym, funded by the Italian Ministry of Forestry and Agriculture, has the aim of exploring the applicability of advanced biological processes to reduce the nitrogen content of agricultural digestates. The research institutes involved in the project are Politecnico di Milano (DIIAR) and the University of Florence (DICEA).

The main focus is the fully autotrophic transformation of ammonia to gaseous N_2 that, compared to conventional bioprocesses, allows to reduce the oxygen demand to one-half, the sludge production to one-tenth and the need of supplemental carbon to zero. The core of this process is performed by the anammox bacteria, discovered in the 90s. This process was recently applied at full scale on reject waters from digested municipal waste sludge and in food, beverages and tannery industries. Only very limited lab-scale experiences are available on agricultural digestates.

Main challenges concern the wide variability in the characteristic of agricultural digestates, their high suspended solid content, the occasional or permanent occurrence of inhibitors such as recalcitrant organics or heavy metals.

In the BRAIN project several lab and pilot scale reactors are in operation to evaluate the optimal conditions and set up, including the need for pre-treatments, operational stability, design parameters and achievable nitrogen removal efficiency.

Moreover, a detailed life cycle assessment will be performed to quantify the main environmental impacts. Finally, the impacts on the agro-energy sector, in terms of possible development of new facilities will be evaluated.

So far, anammox bacteria were precultured on a synthetic medium and later the synthetic medium was blended with increasing fractions of a real agro-digestate, preconditioned by centrifugation and partial nitritation. Nitrogen removal efficiencies in the range 74 – 85% were obtained with agro-digestate at a 1:1 dilution ratio, at a maximum removal rate up to 5 $gNL^{-1}d^{-1}$.

The most relevant results will be presented during the IWA workshop "Autotrophic nitrogen removal: from research to applications", 29 June 2012, Milan Italy
www.sidisa2012.it

Contact details:
Prof.Ing. Francesca Malpei
BRAIN Project Coordinator
Politecnico di Milano DIIAR
Piazza L. da Vinci, 32 Milan (IT)
Phone: + 39 0223996434
Fax: + 39 0223996499
francesca.malpei@polimi.it
www.progettobrain.it

Biomass and district heating and cooling. A win-win!

Birger Lauersen, Manager International Affairs, Danish District Heating Association

Signs are that energy in the future will become more expensive and its use will have to be less environmentally damaging. One way of mitigating both concerns, is to focus on energy efficiency and renewable energy. District heating and cooling (DHC) offers an opportunity to do both.

District heating (DH) is a system in which water is heated in one or several large units and then delivered via underground pipes to residential/ commercial/industrial customers, where the heat is extracted for thermal comfort (building heating and hot tap water) and low temperature industrial use. The cooler water is then returned through parallel return pipes. District cooling (DC) is very similar in concept, the main difference is that it distributes cold water for building cooling.

DH systems facilitate the optimal use and combination of a large spectrum of energy inputs (provides flexibility) and at the same time replaces small scale individual energy conversion (achieves benefits of scale). Surplus heat from a number of sources (power production (CHP), industry etc.) can be utilised and/or fuels that are complicated or cannot be used at small scale (waste) or at the location (biomass, in urban areas) can be put to use. With DHC acting as an energy scavenger, energy or fuels, that others cannot or will not use, can be used, thus providing degrees of efficient to the entire energy system. And that is the main point of the whole thing.

DH systems can cover entire cities with thousands of connected buildings. Like

The automatic cranes in the fuel handling system of a wood chips based district heating plant

Copenhagen, where 98% of all building are connected. Or it can be used in smaller villages, to utilise local fuels or energies thus replacing energy "imports". Today approximately 12 % of the building heat consumption in the EU is covered with DH. Around 3/4 of DH is based on surplus heat; the rest is direct renewable (geothermal/solar) or heat production for the purpose of DH (fossil or biomass fuels). There are more than 5.000 DH systems in Europe. All local systems based on local energy circumstances.

Water thermal storages of a district heating system behind preinsulated pipes awaiting installation in grid

HOW DOES BIOMASS FIT IN HERE?

The demand for heat is the dominant demand for energy services. 37 % of the total final demand for energy is for heat for thermal comfort and in industry. Despite the projected disappearance of building demands for heat in the future, the reality is that much of this demand will exist in 2050 and beyond. Through DH a high share of these individual demands can be concentrated into heat demand points where a portfolio of heat sources can be fed into the system (the flexibility). Some of these sources can be based on biomass. It can be direct biomass boilers, also for peak load or reserve capacity, it can be biomass in CHP or it can be surplus heat from some other biomass uses like liquid bio-fuel production.

In an area where biomass is in abundant supply, a DH system is an opportunity to give value to this local resource and can be entirely based on biomass. The penetration of biomass into DH systems in general much depends on choices made in other sectors, like the share of biomass in power production or liquid fuel production, and on availability (other demands, sustainability criteria and so on).

DH offers biomass an opportunity to be introduced into urban areas (where 3/4 of us live) at a scale that facilitates the use of even troublesome biomass fuels and under environmentally controlled circumstances. And it offers biomass degrees of efficiency wherever it is used for energy purposes. Biomass also provides DH with a renewable and flexible fuel that can be stored and used to balance changes with other sources and in demand. It's a win-win thing.

Storing bales of straw for winter use in district heating

District heating on the path towards low energy cities

By Energy Cities

Cities consume energy. Even a lot of energy. More than half of all people live in cities. Cities induce transports and consume goods. Most industries can be found in urban areas. From an energy perspective, this is the bad side of cities. But cities can also prove very energy efficient. Distances are shorter. Heating and transportation can be shared. Economies of scale can take place. From an energy perspective, this is the good side of cities. So, what do we do with cities?

The concept of low energy cities aims at underlining the better quality of life cities can offer by consuming less energy. Such an ideal city would mean a healthier population (more human powered mobility), more conviviality (public spaces), more solidarity and cohesion, and a relocalised economy focused on the territory.

On the path towards low energy cities, many steps lead the way. At the forefront, local solutions seem to be the most relevant approach. Energy efficiency and local renewable energy sources are the basis of the urban energy transition.

Within this scope, district heating is an effective solution. Already developed in many northern European cities, district heating is gaining interest in other parts of Europe as well, as an efficient, low carbon solution, which can fit well with local energy sources.

The two following examples of Växjö (Sweden) and Echirolles (France) show us how innovation in the field of district heating has more than ever a significant role to play in the energy transition of European territories.

In Växjö, a district heating system connected to a biomass CHP plant is now used to produce cooling for the hospital and the university via absorption chillers. The demand for cooling in Växjö was driven by increased indoor temperatures due to several factors: climate change, powerful lighting, flows of people, widespread use of electronic equipment, and excessive solar exposure of glass areas in modern buildings. Until now, electrical systems were commonly used to solve this. Växjö Energy Ltd (VEAB) demonstrated that electricity can be saved through absorption cooling, which is driven by district heating produced in the CHP plant. The additional heat production for cooling allows for electricity production during the summer period, previously impossible due to a too low heat demand in the summer.

In the La Viscose area of Echirolles, unaffordable electric heating has been replaced by biomass district heating. A similar switch to renewable energy sources is being developed in other social housing areas. As part of the CONCERTO SESAC programme, French consultants visited the City of Växjö to get inspired by their district heating system

Three different options were then explored for La Viscose. The adopted solution – using prefabricated substations in each building – brought improvements to the traditional French model, along with consequent time and money savings.

To go further:

- VÄXJÖ: ABSORPTION COOLING in the Hospital and University (2011)
- LA VISCOSE A warm-hearted district thanks to biomass and solar energy (2011)
- Energy and territories: new breaking points and new cohesions English, French by Gérard Magnin, Executive Director of Energy Cities
- Cities of Tomorrow, Low Energy Cities With A High Quality Of Life For All, Gérard Magnin & Stephane Dupas, 2010
- http://www.energy-cities.eu/cities/members_in_action_en.php

Paving the way for a renewable heat supply for 2020 and beyond

The European Technology Platform on Renewable Heating and Cooling

Climate change and energy security constitute major future societal challenges, which need to be addressed to ensure Europe's future growth and competitiveness. Today the social, environmental and economic impacts of our energy system highlight the urgency of moving towards a new and more sustainable energy scenario. Each year, almost 50% of the total energy consumed in Europe is used for heat generation either for domestic or industrial purposes and the heating and cooling sector will obviously constitute a key player in the EU's transition to a low-carbon economy.

The European Technology Platform on Renewable Heating & Cooling (RHC-Platform), officially endorsed by the European Commission and supported by the 7th Framework Programme for Research and Technological Development, brings together industry and research stakeholders to define a common strategy for increasing the use of renewable energy sources for heating and cooling. The Platform plays a key role in aligning EU

research priorities to industry's needs to ensure knowledge generated through research is transformed into technologies and processes, and ultimately into marketable products and services. The RHC-Platform takes into account the main renewable heating sources - biomass, solar thermal and geothermal - but also cross-cutting technologies, such as district heating and cooling (DHC).

DHC is expected to play a central role in achieving both 2020 and longer term EU objectives. By 2020, in Europe, 25% of energy distributed through DHC networks will be produced from RES. DHC must continue to evolve within its context to ensure its successful deployment as a smart, sustainable and inclusive solution. Further research, demonstration and technological development are needed to enhance DHC possibilities in a future energy landscape. Short and medium term technological research should focus on the optimisation of DHC fundamentals and on the increase of share and range of renewable energy sources that can be effectively employed. The current district heat supplies and distribution networks - adapted to the current level of heat demand - must be enhanced to cope with the increasing renewable supply and the future reduction in heat demands. In parallel, DHC is about creating smart cities by crossing system borders, through cooperation and interaction within the sector - by integrating District Heating with District Cooling - and with other sectors / networks in the urban environment. Energy demand developments need to be anticipated in both the longer and shortest (from hour to hour) term, and a wider range of sustainable applications and solutions – tailor-made to suit customers' profiles – should further replace primary energy intense electricity use for thermal applications. DHC networks, integrated at regional level, will express the full potential of RES for heating and cooling, allowing the development of a holistic approach to thermal comfort needs (heating, cooling and hot water preparation).

The transition to a more sustainable energy system requires high investments, substantial mobilization of public and private funds as well as support from the bank sector. The European Technology Platform on Renewable Heating and Cooling plays a key role in this process. Do not miss out on this opportunity and become a member of the RHC-Platform by proceeding to the free of charge registration on the RHC-Platform website www.rhc-platform.org

RHC Renewable Heating & Cooling
European Technology Platform

Contact details:
Lara Mertens
Bioenergy Project Manager
AEBIOM - European Biomass Association
Renewable Energy House
rue d'Arlon 63-65
1040 Brussels
Tel: + 32 24 00 10 61
mertens@aebiom.org
www.aebiom.org

Offshore Wind Energy: France gets serious

By Mike Edmund

Meteorologists often refer to Atlantic weather systems caused by the prevailing wind blowing from the Southwest. And France is set to take advantage of this wind in a very big way. At present, there is no French offshore wind-powered generating capacity, but that is about to change dramatically according to a recent story in the French daily Le Figaro. Several consortia, it reports, are locked in a battle to install a chain of offshore wind farms on France's channel coast, stretching westwards from Haute-Normandie around the Brittany peninsula. The total generating capacity of these new wind farms will eventually be of the order of 2.5 – 3 GW, roughly equivalent to the output of three nuclear reactors.

Low carbon energy conglomerate Areva will supply its M5000 turbines to the consortium led by GDF-Suez if its bid is successful at three sites in Normandy (Le Tréport, Fécamp and Courseulles-sur-Mer) and to the Spanish clean energy utility Iberdrola for sites in Brittany (Saint-Brieuc and Saint-Nazaire). Meanwhile, Alstom, the large French multinational conglomerate with interests in the power generation and transport markets, is being lined up to supply its direct drive Haliade 150 turbine to the consortium headed by EDF-Energies Nouvelles (EDF-EN).

Areva recently announced that Global-Tech-1, a German offshore wind generation project for which it will supply no fewer than 80 M5000 turbines, has recently been awarded the prestigious "Wind Deal of the Year" at a ceremony in London. According to Areva, the M5000 is rated at up to 5MW, the rotor diameter is 116m, and the carbon-fibre blades themselves are 56m long. The risk of salt corrosion is all but eliminated by hermetically sealing the turbine and creating an internal overpressure to prevent sea air from entering. Meanwhile, the Haliade 150 is rated at 6MW; the rotor diameter is 150m and the rotor blade length 73.5m. To increase its reliability, Alstom has designed this turbine with fewer rotating parts and a permanent magnetic drive. The M5000 is already in production, whereas the Haliade 150, according to Alstom, is still at the prototype stage.

There are many advantages to generating wind power offshore, such as reduced noise intrusion from the equipment and increased availability of space for the installations, although the bird safety argument remains more controversial. And according to Le Figaro, an offshore wind turbine can generate its full power output as much as 40% of the time, which is a great deal better than the terrestrial equivalents can do. But moving the turbines out on to the waves also poses a number of problems for the technology involved: the difficulty and cost of access for routine maintenance place great demands upon reliability, while salt spray makes corrosion an ever-present risk in the harsh marine environment.

HOW MUCH WIND ENERGY IS GENERATED IN EUROPE?

At the end of 2011, a total of 94 GW of wind-powered generating capacity had been installed across the European Union, some 11% up on 2010. Germany generates the greatest amount of wind power (29.1GW, 31% of capacity in this sector), followed by Spain (21.7 GW, 23%). Italy, France and the UK each generate approximately 7% of installed EU capacity. Not every European country has a suitable coastline, so the profile of offshore wind generation is different, and the figures a great deal smaller: across Europe, the total installed capacity is 3.8GW, of which most is generated in the UK (2.1GW, 55%), while Denmark generates 0.9GW (23% of the total). (Data from EWEA)

A little over 400 years ago, When Philip II of Spain learned of the result of his expedition, he is said to have declared, "I sent the Armada against men, not God's winds and waves". Today, by working with these same winds instead of against them, it seems that in one giant leap, France will propel itself into the position of Europe's leading generator of offshore wind energy.

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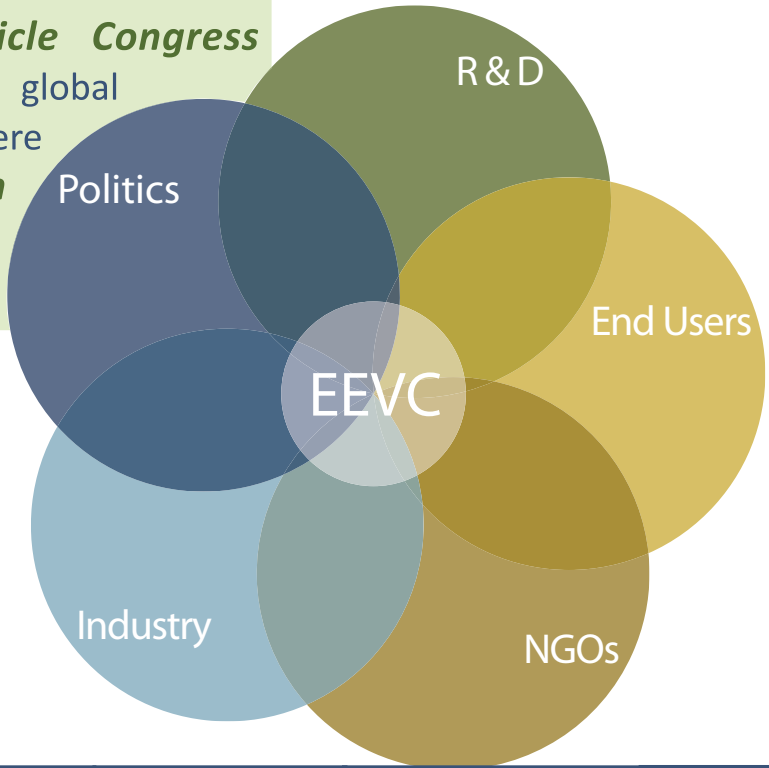

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Entering into a vicious circle of decline

europia european petroleum industry association

Without a swift and comprehensive assessment of the impact of EU legislation on the competitiveness of EU refining, the sector is due to enter into a vicious circle of decline.

The EU refining industry faces substantial demand changes, including demand decrease driven by specific EU policy choices.
EU demand for oil products is facing a declining trend since Europe has become a mature market, fuel prices change driving habits, and as the result of welcome gains in vehicle efficiency.

EU demand is however also driven down by policy decisions to reduce oil use; renewables mandates set alternative fuels targets; policy scenarios derived from the Low carbon Roadmap call for a drastic and costly reduction of oil in transport, which if realised, literally shape the end of the refining business as we know it today.

Policies also impose changes in qualities and incentivise certain energy products; energy taxation favours diesel over gasoline; the EU Sulphur in Liquid Fuels Directive proposals will impose the use of diesel instead of bunker fuels, thus creating an unmanageable mismatch between EU gasoline and diesel supply and demand in the EU.

However, despite the decrease of EU demand for oil products, oil will remain, even in the most ambitious IEA scenarios, around 20% of energy mix and more than 50% of energy for transport. Therefore a competitive EU refining is essential for the foreseeable future.

In addition to the strong pressure on the demand side, the industry is also facing substantial challenges on the supply side, as a result of the heavy burden of EU legislation.
The supply side is also critical because oil products markets and the refining industry are global and cannot be looked at only in an EU perspective: EU refining must indeed have an internationally competitive cost structure to compete against non EU suppliers on both the EU internal market, and equally vitally, to compete in export markets, such as the US market to export its gasoline surplus.

EUROPIA constantly highlights that, despite a competitive advantage for example in energy efficiency, a competitive disadvantage is created by the cumulative and twofold impact of EU legislation.

On the one hand, legislation such as the price of carbon, Fuel Quality Directive (Art. 7a) or REACH increase the operating costs of refining in Europe. On the other hand, legislation such as the Industrial Emission Directive imposes massive investments and capital costs with no perspective of return on those investments. Such operating and capital costs considerably damage the competitiveness of EU refiners compared to its non-EU competitors who not only do not have the burden of legislative costs, but also have in some cases very supportive governments and operating regimes.

If the EU refining industry cannot compete on the global export market to replace declining EU demand, for example to export gasoline, the pressure within the EU will escalate and could lead to a vicious circle of decline.


Isabelle Muller

The major consequence of these pressures is that EU refining as a whole is struggling to remain internationally competitive and viable. This will force capacity reduction, with major economic and social consequences.
The EU's competitive disadvantage and poor investment outlook make adaptation of EU refining to demand quality changes unprofitable and are most likely to accelerate further capacity reduction , probably beyond that required by EU demand decline. This will also threaten the industrial value chain depending on it, in particular petrochemicals. Overall, it will affect EU security of product supplies, cause the unnecessary loss of many highly technical jobs, a major loss of value added in the EU (€30B/year), and affect the EU balance of trade.

EUROPIA therefore calls for a monitoring and assessment of the impact on the competitiveness of the EU refining sector of existing, planned legislation and future policy proposals, and recommends appropriate reviews and actions based on the outcome of such assessment.

1. The proposed BREF (Best available Techniques) requirements of the Industrial Emissions Directive could cost between €10 and 30B over the next 10 years just to continue operations, and not to improve profitability.
2. Potentially between of 40-70% by 2050
3. ≈1.5M in the refining-petrochemical supply chain

Oil: Climate and economics – a potent mix

By Mike Edmund

Jack: **That, my dear Algy, is the whole, truth pure and simple.**

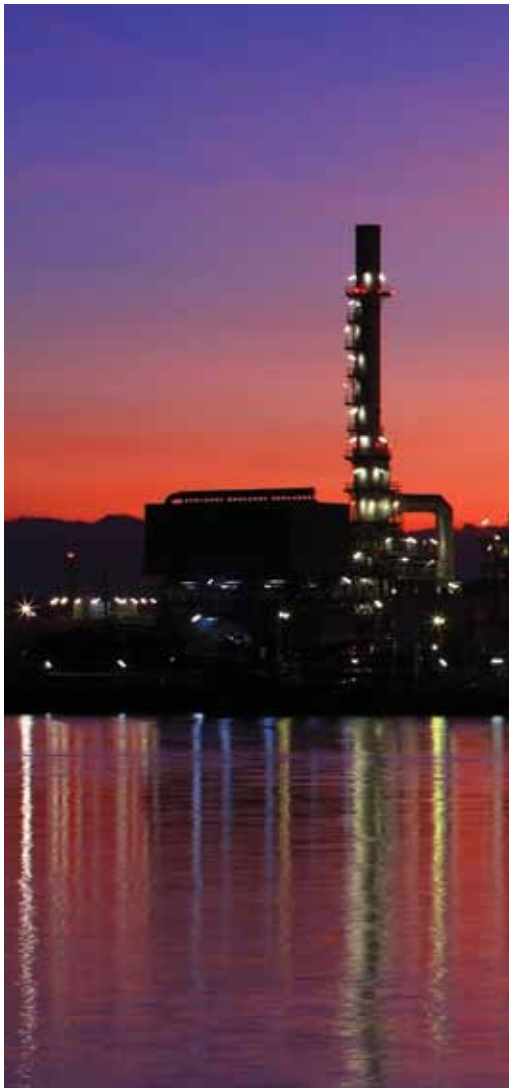
Algernon: **The truth is rarely pure and never simple. Modern life would be very tedious if to were either, and modern literature a complete impossibility!**

Oscar Wilde, The Importance of Being Earnest, Act 1

Often quoted as "The pure and simple truth is rarely pure and never simple.", the literature to which Algernon referred might almost have concerned that currently being written about the world's energy paradigm. The plain truth is that it is impossible to discuss climate change without significant reference to economics - the value of crops lost to floods, or the cost implications of offshore wind farms. Or the price of a barrel of oil. Indeed much of the impetus for developing alternative technologies could be said to be economic in nature.

Here are some simple facts: world population and demand for energy are both growing. The OECD recently warned that, in spite of the current economic situation, countries need urgently to seek greener sources of growth if they are to avoid irreversible environmental damage. Behind the stark message are some simple figures. According to the OECD, world population will rise to over 9 billion by 2050; world energy demand will rise 80% in that time, and greenhouse gas emissions by 50%. But perhaps the most significant of their predictions is our 85% reliance upon fossil fuels: it is simply impossible to ignore their significance to mankind. But the OECD document also offers a bleak view of the environmental effects, with double the number of premature deaths caused by urban air pollution; with global biodiversity declining by 10% and global water demand rising by 55%.

And now some more simple figures: according to the World Bank, The US consumed 12194 kWh of electricity per capita in 2009. Corresponding consumption in China and India was 2631 and 571 kWh respectively. Per capita output of carbon dioxide in 2008 was 18.0 metric tonnes in the US; in China, it was 5.3, and in India, 1.5. Put another way, there would clearly be significant consequences if the average Chinese or Indian inhabitant were to consume as much electricity as the average American; or produce as much CO_2. And there are, of course, many more Chinese and Indian people on the planet. Space here does not permit philosophical debate about whether inhabitants of one country have any more - or fewer - rights to energy than those of any other within this environmental context: Kyoto and Durban have sought to address that particular issue. Neither do these columns permit detailed financial examinations, for the cost of producing all this extra power is a fiendishly complicated affair. And this "cost" is, of course, not simply measured in pounds, dollars or euros. Among other things, the expense of prospecting, new



plant, maintenance; of cleanup and decommissioning and of research and development of new technologies all need to be accounted for, as does the cost of raw materials if we are to arrive at meaningful figures. All that, and any subsidies such as feed in tariffs. Nevertheless, the consensus appears to be that fossil fuels represent a relatively cheap source of energy, while renewables are relatively expensive. This is perhaps especially the case with developed oilfields,

where the incremental cost of pumping one more barrel must be very low. Or can it really be that simple?

Dr. Randy Gossen, President of the World Petroleum Council, argues that there is no single solution to our energy challenges, but that future energy supply rests upon three interdependent factors: investment in unconventional oil and gas supplies, which requires higher sustained prices; innovation, to exploit these less accessible oil and gas fields; and, crucially, cooperation between state and international oil companies. The issues appear hugely complicated, and yet he neatly explains the decisions we face while illustrating the difficulties we will encounter.

None of the "cost" arguments above reflects "ability to pay"; and much of the developed world is wrestling with debt. The "austerity versus growth" argument currently occupies many minds, in Europe and elsewhere, even as it affects investment decisions. While it is clear that "doing nothing" is not an option, it is not immediately apparent how significant investment is to be funded. And it is also plainly the case that matters are not as simple as that. The polar bear that perceives it has less ice and more water to patrol might not understand, while Algernon probably would. Wilde, on the other hand, would doubtless have smiled enigmatically.

Safe nuclear energy for Europe

Philip Lowe, Director General for Energy, European Commission, DG ENER

The severity of the Fukushima nuclear power plant accident that followed the earthquake and tsunami of 11 March 2011 raised concerns on nuclear safety worldwide. The world was shocked by the scope of the accident itself and even more so by how long it took to get things back under control. In a lot of countries it seriously undermined public confidence in the use of nuclear energy as such. While nuclear energy still represents 30% of electricity generation in the EU, it remains a very sensitive issue in all European countries.

Responses to the Fukushima accident differ from one Member State to another. Germany decided to abandon nuclear power altogether. Italy decided against a reintroduction of nuclear energy. The majority of EU Member States did not change their energy mix in response and nuclear energy will continue to be a large scale low carbon option of our energy mix for the next decades to come. It remains each Member States' decision whether to use nuclear power.

The role of the EU is to ensure that the highest standards of safety and safeguards are applied in all Member States

and build mutual confidence within Europe through a dynamic process of peer review.

Safety has always been an overriding priority in nuclear policy. Our rules on safeguards and safety have been based on the requirements of the main international agreements, namely the Convention on Nuclear Safety and the Safety Fundamentals established by the International Atomic Energy Agency. But their impact is all the more important as they have become legally binding in all Member States under the EU's 2009 nuclear safety directive.

After the Fukushima accident, the EU quickly launched comprehensive safety and risk assessment of all European nuclear power plants. In the light of the lessons learned, the Commission, and national nuclear safety regulators, have identified a number of policy areas where further action is deemed necessary, either through direct improvements on the ground – for example to deal with temporary loss of cooling systems – or through better coordination among Member States or by proposing new EU legislation on nuclear safety. In particular, the principle of regular peer reviews is becoming widely accepted.

These efforts should not stop at EU borders: international cooperation to strengthen the safety culture and emergency preparedness worldwide is more important than ever. The EU considers that all other countries operating nuclear power plants should carry out similar safety and risk assessments as soon as possible. So we will continue to enhance our cooperation with international players in this field.

A second pillar of nuclear energy policy is the radioactive waste directive, adopted last year. This directive commits Member States for the very first time to a final disposal of nuclear waste. This makes the EU the most advanced region in the world in terms of safe management of radioactive waste and spent fuel. Member States are required to define measures for managing their radioactive waste and spent fuel up to final disposal. Equally, they have to involve the public closely in the decision-making processes.

Establishing a national policy is a starting point of any successful waste management programme, but it must result in concrete actions. In order to avoid undue burden on future generations, it is important to take action today.

The primary responsibility for the safety of nuclear power production will always lie with plant operators under the supervision of national safety regulators. But the common approach at EU level is producing results. In less than three years, the EU has worked to improve safety standards, take commitments on waste management and outline new developments to adapt to a changing context. This dynamic should be pursued in the near future to enhance the legal framework and strengthen nuclear safety and security culture in Europe and beyond. The European Commission is committed to this vital task.

Nuclear Power: defining its role

By Mike Edmund

In his 1954 speech to the National Association of Science Writers, Lewis Strauss used the phrase "Our children will enjoy in their homes electrical energy too cheap to meter..." He was speaking about atomic energy, although it was nuclear fusion, not the more familiar nuclear fission, that was on his mind. Nevertheless, atomic power was heralded sixty years ago as answering mankind's energy problems. But last year, an earthquake off Japan triggered the tsunami that wrecked the Fukushima nuclear facility, while in the intervening decades the names Three Mile Island and Chernobyl have come to the attention of the public. Japan has switched off her nuclear generation; Germany will do the same, while Italy will not switch hers back on. No doubt these responses bore public disquiet in mind. Elsewhere, civil nuclear power is illegal in Austria; yet in France, it generates over three-quarters of the country's electricity. Moreover, 30% of Europe's electricity comes from the atom. Obviously, all of these approaches cannot be right. As the Director General for Energy Philip Lowe explains elsewhere in this issue, safety is of paramount concern here, which surely has once again to do with public perception. In this case, perception of the consequences of a nuclear mishap - natural, accidental or as a result of terrorist activity.

So what risks does nuclear power present? What is its place in a low carbon Europe? Is it anything more than a diversion on the 2050 roadmap?

We cannot explore every aspect of this complicated paradigm here. But we can share some of the definitions of the European Agency for Safety and Health at Work:

- A hazard is anything that can cause harm (e.g. work materials, equipment, work methods and practices)
- The risk is the chance of harm being done (likelihood and the extent of harm)
- The harm is a negative safety and health consequence (e.g. injury, or ill health)

Some real events may further our understanding. Courrières in the Pas-de Calais region of France was the scene of Europe's worst-ever mining accident, when 1,099 miners, including many children, died on or shortly after the 10th March 1906. In this context we can understand that a coal mine represents a hazard, and we can understand the harm that was done - we can count the number of dead, for example. In short, we can measure the disaster; we can understand it - even if we cannot completely assess the level of risk that existed in the mine shortly after 06:30 on that fateful Saturday morning.

We could also see the harm when 600 Kuwaiti oil wells were set aflame by Saddam Hussein's

retreating forces in 1991. We could see the plumes of black smoke; and we could measure the lost oil production and the cost of the clean up: we could understand the environmental tragedy that unfolded. The point is that these events are no less disastrous because we understand them better, but Three Mile Island, Chernobyl, and now Fukushima, all occupy an altogether different place in the collective psyche. Is an accident any more likely in a nuclear facility than in a coal mine? Is any resultant harm likely to be greater? Is it more to do with the invisibility of radiation? For, unlike an oil slick on the ocean, we cannot see it, even if we can measure it with a Geiger counter.

The WHO has just released its report of the irradiation following the Fukushima accident. It finds that Namie town and Itate village, near to the plant, are exposed to radiation doses of 10-50 millisieverts (mSv), and the rest of Fukushima to doses of 1-10 mSv. By way of comparison, natural exposure is of the order of 2 mSv per year, while the single-year limit for occupational exposure of workers is 50 mSv.

Lewis Strauss may well have been too optimistic. The German, Japanese and Italian responses to Fukushima may or may not turn out to be appropriate. But it is clear that if nuclear energy is to continue to occupy a significant role in Europe's low carbon future, one or two misunderstandings need to be cleared up first.

Austria's new energy future

Dr Reinhold Mitterlehner, Federal Minister for Economy and Energy

Europe's energy system is facing huge challenges which have been accentuated further by the nuclear disaster in Fukushima. The inevitable reduction of the proportion of nuclear power in the energy mix has increased the pressure in many countries to introduce a real change in sources of energy. It is even more important within the framework of the EU's 2020 targets to use every opportunity to move our energy supply as soon as possible towards an efficient, renewable and secure system. Only in doing so, Europe can take a leading role in the globally competitive field of renewable energy and non-carbon-based technologies. Moreover, the dependence on oil imports must be reduced in the long term in order to protect business and domestic users from large fluctuations in energy prices and supply.

In Austria, in order to be able to shape this process pro-actively, the further development of already well established alternative energy sources will be accelerated on all fronts. Within the framework of the new Green Energy Legislation, the share of renewable energy sources of our total electricity consumption will increase to 85% by 2020. With renewables currently standing at 68%, Austria is leading the field in Europe. As a result of our amendment, a total of 12 billion Euros in investment funding will be released for green technologies until 2020, thereby increasing the competitiveness of producers of green energy. This helps businesses with exports, because green innovations 'Made in Austria' are increasingly sought after world-wide. Furthermore Austria will be able to successfully position itself as an important energy hub. Through the extension of domestic pumped storage power stations we are increasingly becoming the 'green powerhouse' of Europe.

These positive developments underline the fact that within the scope of the Energy Strategy for Austria the right measures are being brought forward in a timely manner. While other European countries are still in the starting blocks, Austria is fully engaged in changing its energy provision and is thereby well on the way towards achieving the energy targets of the European Union.

In the area of green energy we want to give incentives to renewable energy technologies to become cost competitive. Under the new legislation annual subsidies will more than double to 50 million Euros. In order to take account of technological development and to avoid excessive demand, total funding will decrease by one million Euros a year to 40 million Euros in 2021. In particular, we are further developing the means of production of future photovoltaic technology, but wish to ensure, through this reduction in funding, that cost reductions in technology are fully taken account of.

Each year the available funding will be split between the different technologies on the bases of an analysis of their potential. In this way we shall reach an optimum energy mix and will increase Austria's security of energy supply while keeping track of costs. With this funding, constructors and operators of green energy plants will receive support for 13 years or, in the case of raw material dependent plants, for up to 15 years, with entry tariffs guaranteed by the energy distributors. It was important when drafting the Bill to ensure a reasonable balance between the interests of producers and buyers of green electricity. Likewise the legislation's new financial model supports and promotes the international competitiveness of energy-intensive businesses.

Alongside the development of renewable energy sources, efficient deployment of energy supply is the keystone of a sustainable energy future. Indeed, the cheapest and most environmentally-friendly electricity is still that which has not yet been consumed. Therefore we want to reduce energy consumption through various measures and to stabilise it at 2005 levels by the year 2020. The requisite national measures and targets will be drawn up along agreed EU-wide energy efficiency guidelines for Member States, which will be binding both for national administrations and for energy distributors.

In this context the introduction of Smart Meters prescribed by the European Union brings new opportunities and challenges. The greater transparency enabled by Smart Meters should increase cost awareness, thereby making energy-saving easier for consumers. Simultaneously Smart Meters combined with Smart Grids support further advances in renewable energies, leading to more efficient use of the national energy grid.

Green energy for urban areas
The Vienna approach – a model for Europe

Wien Energie's eco-friendly energy approach is a model to cities all over Europe. It features a mix of combined heat and power (CHP) plants, a drive to introduce renewable energy sources and district heating.

Green technologies not only help combat climate change, they also create jobs – so people profit twice over.

There was a big run on the first "Vienna citizens' solar power plant". Residents snapped up all the shares in a single day. How does this novel project work? Local people invest in solar power, and Vienna energy utility Wien Energie makes it happen. Private investors can buy photovoltaic (PV) modules that go to make up a solar power plant, up to a limit of ten panels worth a total of €9,500. Wien Energie leases the panels back from the owners and makes annual lease payments for them. The company is responsible for construction and maintenance of the systems, and their operation. The investors receive an annual return of 3.1 percent on their capital. The maturity is five years, but it is possible to request early payback, in which case there is an administration fee of €75. At the end of the useful life of the plant, in about 25 years, Wien Energie will buy the PV modules back, and the entire capital invested will be returned to investors. The first "citizens' solar power plant", being built on the site of a power station in north Vienna, will have 2,100 PV modules.

Three other solar generating stations with funding from the public will be constructed in Vienna in 2012 (for additional information visit www.buergersolarkraftwerk.at).

Fifty percent renewable contribution by 2030

Solar is set to become a major component of Vienna's energy mix. The city aims to boost the renewable share of total power generation to 50 percent by 2030. Wien Energie intends to invest about €200 million per year in renewable energy sources to hit that target. A number of projects are currently under way. For example, a wind park with nine turbines and a total capacity of 18 MW is taking shape outside Vienna, in cooperation with regional energy utility EVN. Viewed from a climate perspective, that adds up to an annual saving of 28,000 metric tons of CO_2. And there are plans for a geothermal plant close to Vienna's Aspern district – one of Europe's largest urban development areas. If the geothermal well is as productive as hoped, the project could raise the proportion of the city's district heating supplied by renewables by five percent.

Wien Energie's "Vienna model" commits it to providing the greater Vienna area with environmentally-friendly energy supplies from highly efficient, low-emission generating stations. What makes Vienna a true model for Europe is the mix of technologies – a combination of highly efficient CHP plants, renewable generating capacity and district heating. CHP plays a key role in keeping down CO_2 and particulate emissions.

Vienna's district heating not only comes from CHP stations, but from energy from waste plants, too. Wien Energie has been using about 950,000 tonnes a year of municipal waste for district heating for over 40 years now. The company supplies about 318,000 homes and over 6,200 large consumers with eco-friendly district heating. In all, Vienna's model approach to energy supply cuts annual CO_2 emissions by about four million tonnes. ●

Key role for energy efficiency

Moving to energy supply technologies that are socially acceptable but do not overtax the planet's ability to regenerate will be one of the biggest challenges of the next few decades. Just changing over to renewable energy sources will not be enough – our whole way of living and producing goods will have to be fundamentally transformed.

Otherwise, the EU's ambitious 20-20-20 targets will probably be a pipe dream. The EU is aiming for a 20 percent reduction in greenhouse gas emissions (on 1990 levels), an increase in the renewable contribution to 20 percent, and a 20 percent cut in energy consumption. On the upside, more sustainable energy systems would not just help save the climate, they will enhance Europe's competitiveness in green technologies. And efforts to increase energy efficiency and phase in renewables could create some two million jobs by 2020. Greater use of alternative energy forms would also improve security of supply and cut dependence on imports of fossil fuels.

To get there, we all need to shoulder our personal share of the responsibility, by living and working in ways that save energy. Wien Energie promotes more intelligent and frugal use of power and heat by running advice centres that provide valuable energy saving information for private consumers and businesses. For further information visit www.wienenergie.at.

Thermal store

In order to boost its energy efficiency still further, Wien Energie plans to build a heat storage facility. This will enable heat from waste incinerators, and biomass and CHP plants to be stored and used at peak demand periods. It will mean that the timing of heat generation and consumption can be decoupled. As a result, the use of gas or oil-fired peaking boilers will be minimised, that of CHP plants optimised, and Vienna's carbon emissions reduced by about 20,000 tonnes/year.

Pumped storage power plants

Dr. Paul Rübig, MEP

The green energy revolution is introduced effectively. Because of the subsidies for renewable energies almost 20 % of the electricity supply in Europe is "green". Austria is leading in the EU with more than 60 % electricity produced on the basis of renewable energies. In the future renewable energies will become an important pillar of the European electricity supply. Because of the German nuclear phase out until 2022 and the progressive swift away from nuclear electricity production in Switzerland, renewable capacities will increase. In medium- to long term, renewables will account for more than a half of the European electricity production.

Despite of all the advantages like climate protection or preservation of resources, the upcoming expansion and integration of renewables will become a technical and economic challenge for the European electricity supply. One possibility to tackle this challenge is electricity production with hydro power.

The electricity production with hydro power plants has significant economical and environmental benefits. When talking about hydro power it is necessary to differ between run-of-river power plants, which produce clean electricity around the clock and pumped storage hydro power plants. These plants are able to produce at very short notice a huge amount of electricity to cut consumption peaks. Pumped storage power plants are also important to balance the fluctuating production of other renewables. Because of the ability to react very fast and to balance electricity demand and supply, Austrian pumped storage power plants secure the grid stability in central Europe. In order to successfully integrate large amounts of intermittent renewable electricity production, mainly wind and solar, a swift extension of the European electricity storage infrastructure is needed. Today pumped storage power plants are the only large scale electricity storage technology available to provide flexible and back up capacity for fluctuating renewable energy production.

60 % of the Austrian electricity consumption is produced with hydro power plants. In the year 2010 the Austrian hydro plants produced about 42 billion kWh of CO2 and NOx emission free electricity. In figures, hydro electricity production avoids 20 million tons of CO2 compared with thermal electricity production.

In Europe and especially in Austria there is further development potential for pumped storage power plants.

The Austrian electricity industry will further invest in hydro power plants in the next years. At the beginning of 2012, 16 projects were in the building phase and 42 projects in the planning or in the approval phase. The pumping capacity should be increased for more than 600 MW to 1830 MW. Also the turbine capacity will be increased from 4630 MW to 8250 MW.

Because of the topographic situation, in the middle of the Alps, and the ongoing investments, 14 % of the European pumped storage capacities are located in Austria.

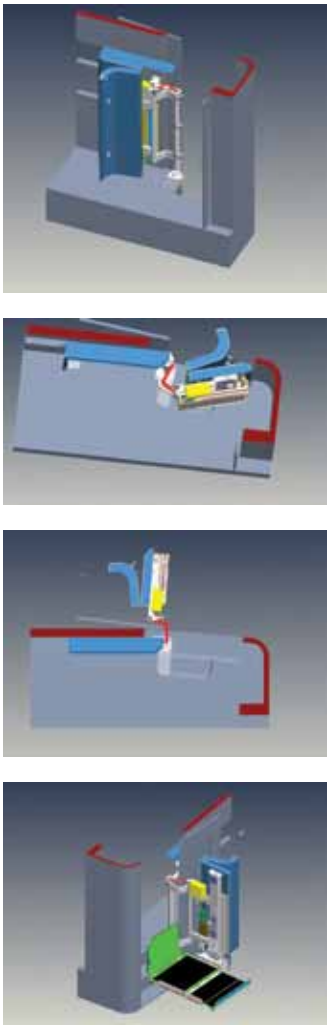
Austria can be seen as the "green battery" in the heart of Europe.

European policy makers have to make sure that the right framework conditions for hydro power are in place to encourage investments. Only if the current barriers are abolished hydro power and in particular storage can deliver its benefits for the European power system and act as "green battery".

PubTrans4All
Public Transportation - Accessibility for All

PubTrans4All – Public transportation – accessibility for all

The project "PubTrans4All" is funded under the 7th Framework Programme of the European Union and it aims to develop a prototype of a vehicle-based boarding assistance system (BAS) that can be installed into new rail vehicles or retrofitted into existing rail vehicles to improve accessibility for persons with reduced mobility (PRM) – disabled persons, elderly, persons with prams, persons with heavy luggage etc.



3D Design Concept of the new BAS prototype
Source: MBB Palfinger

Accessibility for rail vehicles is particularly problematic since rail vehicles have a long service life (40 years or longer) which means that many currently inaccessible vehicles will remain in service into the future.

The PubTrans4All project's objective is to develop a prototype of a standard BAS that can be used on many different types of rolling stock and infrastructures. As a part of developing a new prototype of a BAS, the consortium surveyed at the beginning of the project state of the art accessibility devices and made recommendations for best practices of use and operation of these devices.

Furthermore an international student contest was held finding new ideas and innovative solutions for a new BAS. 38 students from Austria, Hungary, Serbia, Croatia and Bulgaria participated at the contest and submitted their ideas.

As currently no vehicle-based BAS exists for classical UIC- wagons, the consortium decided to develop a BAS for this type of wagon. Installation investigations and technical calculations led to the adoption of the swivel lift concept as the best suitable design concept for the restricted space conditions in classical UIC-wagons.

The construction and testing phase of the prototype of the BAS has started in January 2011. After laboratory-testing, the prototype will be installed into a UIC wagon provided by BDZ and will be field tested on the national railway infrastructure of Bulgaria.

The multi-disciplinary and geographically diverse consortium consists of 13 partners from seven different European countries:

- Rodlauer Consulting (Coordinator)
- BDZ Passenger Traffic EOOD
- Bombardier Transportation GmbH
- MÁV-START Zrt.
- MBB Palfinger
- National Railway Infrastructure Company of Bulgaria
- ÖBB Austrian Federal Railways
- SBB AG Federal Railways Switzerland
- Siemens AG Austria
- Slovenske železnice
- University of Belgrade
- Verkehrsbetriebe Karlsruhe GmbH
- Vienna University of Technology.

Especially beneficial is the participation of several Eastern European partners – since accessibility is not sufficiently recognized as a problem in many of these countries. Accessibility for all is essential for creating an equitable, effective and efficient transport system. Therefore the PubTrans4All project will help building a fully accessible rail network.

For further information about PubTrans4All, please visit our project website **www. pubtrans4all.eu** or contact the coordinator by mail:
Rodlauer Consulting e.U.
Reinhard Rodlauer
Hertha-Firnberg-Straße 10/4-1-2
1100 Wien
phone: +43 1 29 84 400
e-Mail: office@rodlauer.com
www.rodlauer-consulting.com
www.pubtrans4all.eu

Green innovations create new green jobs

The Austrian environmental and energy technology industry makes a considerable contribution to sustainable growth and to an improvement of the environmental situation in Austria and abroad. Research, development, and innovation are key factors for the growth and productivity of a national economy.

Austria has a wide know-how as regards energy-efficient technologies as well as renewable energy technologies, for example in the context of buildings, and broad diffusion of this know-how could drastically reduce the demand for energy in this field.

The transformation and structural changes in the entire energy system offer a wide field of applications- for corresponding technologies and Austria is aiming at a leading position in this technology domain. This finds its expression notably in the joint vision of the Austrian Environmental Technologies Masterplan: "*Within the European Union Austria has the leading position in the fields of environmental technology and environmental services.*"

Over a period of slightly more than 20 years the environmental industry in Austria has shown a very dynamic development. Austria's environmental technology industry has an above-average expenditure on research and innovation and especially the field of energy technologies is very research-intensive and innovative.

Austria's environmental technology enterprises demonstrate that environmental protection and economic growth do not contradict each other. On the contrary, during the past decade Austria´s environmental technology industry faced annual turnover growth rates of 10 %. Presently there are 210,-000 green jobs all over Austria - the volume of the green job sector is thus about the same as that of the tourism sector.

Thus, in Austria, environmental technology has become a field of employment which is of importance for the country's economy as a whole. To further stimulate this development the following priorities have been set:

- Promotion of exports of environmental and energy technologies
- Enhancing innovation in the green tech sector
- Fostering green building technologies

Furthermore, the Green Jobs Masterplan, published in 2010, set the goal to create 100,000 new green jobs until 2020. The Masterplan laid down 17 clusters of measures in 6 areas of action, which will enhance climate change mitigation, environmental protection, and green job creation. The Ministry for Agriculture, Forestry, Environment and Water Management is investing €700 Mio. p.a. in climate and environmental protection measures, promoting green jobs and supporting green innovation.

DI Nikolaus Berlakovich, Federal Minister of Agriculture, Forestry, Environment and Water Management

Austria aims to be independent from fossil energy imports by the year 2050. Present scientific studies underline that this goal of energy autarky is realistic and within reach. The Green Jobs Masterplan and the further development of energy technology are substantial elements to reach this goal.

Reconciliation of ecology and economy is the goal to be tackled to ensure a sustainable future.

New paths for climate protection and energy efficiency

Zero Emission Austria

We are pursuing the philosophy of 'Zero Emission Austria' which is of primary importance to the areas involved in the climate and energy-reduction trials. Through example, they are taking a practical lead in the energy future and setting up locally viable climate protection initiatives. Austria is rich in renewable energy resources. If we use this opportunity in a timely manner, everyone will benefit.

The Climate and Energy Fund has for more than five years been the Austrian government's primary instrument for climate protection, improved energy efficiency and the innovative development of renewable energy. It has established itself both as catalyst and an effective partner for domestic businesses and organisations which, as a result of targeted support, are consolidating their already strong position in the international market place and creating permanent jobs.

Theresia Vogel and Ingmar Höbarth, Chief Executives of the Climate and Energy Fund, Austria

ZERO EMISSION AUSTRIA

The Climate and Energy Fund underpins Austria's new energy policy. 'Zero Emission Austria' is therefore a motto which requires ambitious new initiatives, needing in turn changes in numerous social and economic domains. However, with 35 000 climate protection projects underway, the Climate Fund has already provided much important stimulus, demonstrating its effectiveness. Thus in the area of energy research it has succeeded in increasing the research quota by over 200 per cent over the year 2006/2007. The advances in photovoltaics in Austria in the past year can also largely be attributed to sponsorship by the Climate and Energy Fund – to date more than 12 000 photovoltaic installations of up to 5 kilowatts have received support.

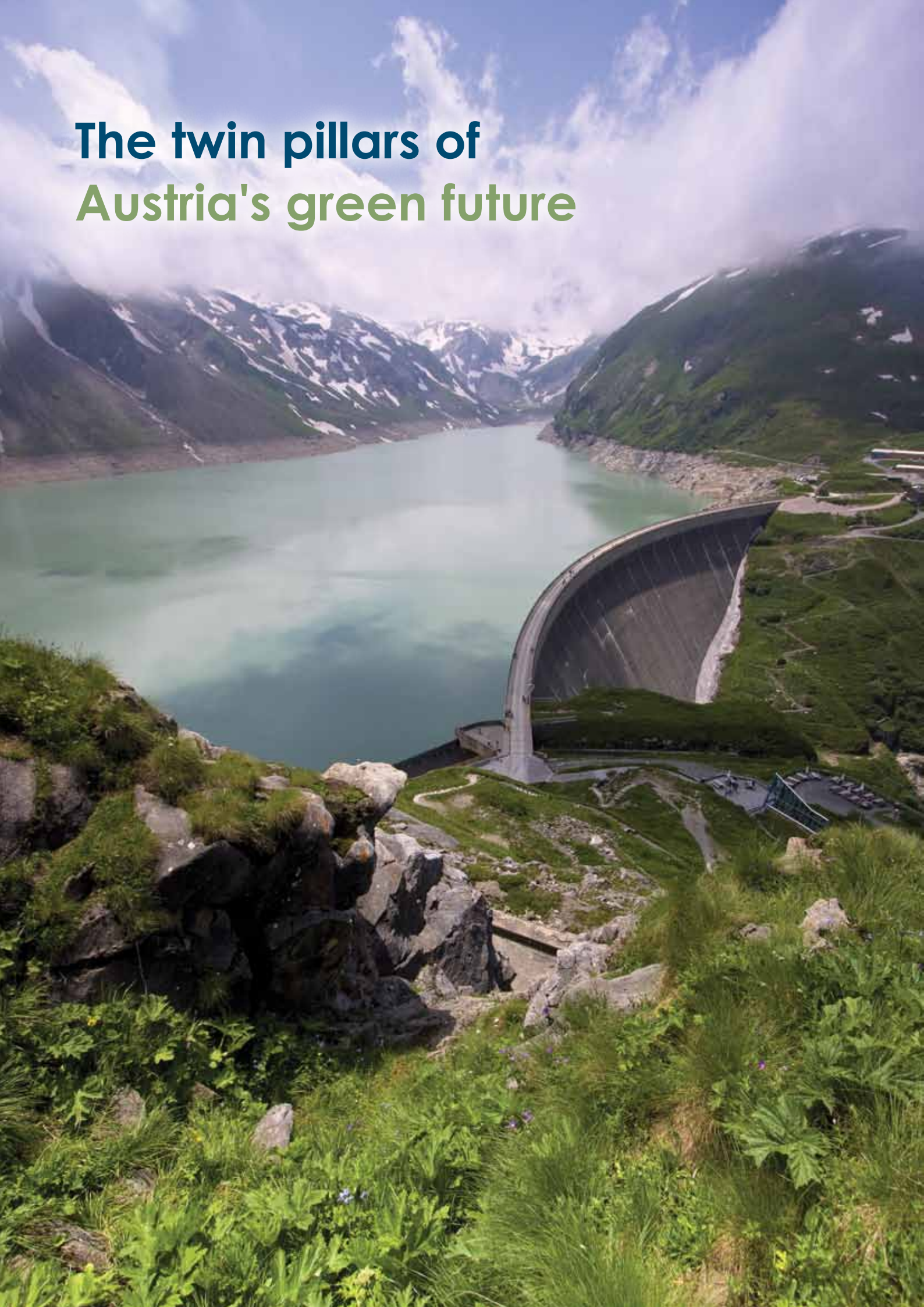
The Climate and Energy Fund's individual programmes pump-prime countless follow-up projects – approximately 35 000 so far that have benefited from around €600 million since 2007, and have been instrumental in attracting approximately 1.18 billion Euros' worth of investment in Austria. In 2012, under the auspice of clime protection, the Climate and Energy Fund will distribute a further €130 million to worthwhile long-term energy and transport projects.

THE MULTIPLIER EFFECT

Use of trial areas is one of the most effective strategies for bringing new ideas to fruition. The 85 areas involved in climate and energy trials which have been established since 2009 with pump-priming from the Climate and Energy Fund, today enable 882 communities, comprising almost a quarter of the population, to develop alternative sources of energy and to reduce emissions. These have sprung from a handful of forward-thinking initiatives a few years ago. Nowadays there is broad-based support for regional energy generation and energy usage reduction projects. Add to these, the 1.7 million Austrians who live in Smart Cities or in the lead regions for E-Mobility, then 4.8 million citizens benefit daily from the work of the Climate and Energy Fund. The Climate Fund benefits the whole of Austria. ●

Klima- und Energiefonds
Gumpendorfer Straße 5/22
1060 Wien, Österreich
Tel. +43 (0)1 585 03 90
office@klimafonds.gv.at
www.klimafonds.gv.at

The twin pillars of Austria's green future



Do what you can, with what you have, where you are.
Theodore Roosevelt

With its 20-20-20 targets, Europe has embarked upon an ambitious environmental programme. Against this backdrop, Austria seeks to develop a sustainable energy system that emphasises security of supply, environmental compatibility and cost effectiveness. It calls for a 16% reduction in greenhouse emissions and for 34% of its energy to be derived from renewable sources.

AUSTRIA CLEARLY HAS A PLAN. AND THAT PLAN IS WORKING.

Austria has two significant natural renewable energy sources: water and biomass. Hydropower currently generates over two thirds of Austria's electricity. Interestingly, there is a relatively large number of decentralised small units: in 2007, 1918 (83% of the total) hydropower units were rated at less than 1MW, and generated 1190 GWh, or less than 3% of the country's hydroelectricity. Austria's decentralised model can also be seen with its biomass: almost 50% of the country is forested. A substantial proportion is owned by small farmers with less than 40 hectares, and the government has sought to develop this resource. The strategy can be seen in practice in a 3.6 GW woodchip-powered district heating plant at Grieskirchen, where wood heating technology company Fröling has taken a 24% stake in a partnership with 26 farmers, each of whom owns between 2% and 4% of the project.

But it is perhaps in the town of Güssing where Austria's renewable energy strategy is at its most striking - and instructive. Güssing was the first community in the EU to become completely independent of fossil fuels, deriving 100% of its energy requirement, including all its electricity, its heating and cooling and its fuels, from renewable resources found within the region.

The project began in the early 1990s with the decision to stop using fossil fuels in public buildings. A wood-fuelled district heating project followed, and then a facility for converting rapeseed into fuel and a wood chip gasification plant. This powers a Combined Heat and Power (CHP) unit that generates electricity and produces warm water for the district heating system. There are now 27 power plants throughout the region with a combined "energy" turnover of about □14 Million, part of which is reinvested back into renewable energy projects. Significant power plants include a 4.5 MW wood gas generator power plant in Güssing and a biomass gasification power plant using green silage (materials like grass, clover and sunflower) in nearby Strem. But perhaps the most significant statistic of all concerns sustainability: this activity currently consumes less than half of the yearly growth of new wood.

Apart from its obvious environmental credentials, there have been a number of social and economic benefits. Twenty years ago, Burgenland was the poorest and least developed region of Austria; and the Güssing region was one of the poorest within Burgenland. Today, the region is home to a number of innovative technologies; and to highly trained technicians and scientists. Standards of living have risen, and at least fifty new enterprises have generated more than 1,000 jobs. Recently, Güssing concluded a $500 million (□390 million) agreement with Clear Edge Technology for fuel cell technology with an initial 8.5 MW capacity, rising to 50MW by 2020, much of which will be exported to the National Grid.

Those consulting the UN database might be surprised to learn that Saudi Arabia is 0.5% forest: clearly there is little possibility of significant renewable wood-chip biomass energy. But, like the Austrians, the Saudis are doing what they can, with what they have, where they are.

Step by Step towards Energy Autonomy 2050

To achieve the 2°C limit for climate change the industrialized nations have to reduce their CO_2 emissions by roughly 90%. Also other framework conditions like resource shortages, peak oil, dependency and risk reduction require action. That is why the Vorarlberg provincial government adopted energy autonomy based on renewable energy sources as a long-term policy goal in a unanimous decision.

ENERGY AUTONOMY VORARLBERG

Energy autonomy cannot be achieved simply by replacing fossil fuels. Simultaneously, buildings, mobility and industry needs to significantly lower energy demand. Therefore ten thematic groups elaborated on the one hand concrete measures; on the other hand they described value-based (vivid) principles to be successful in the realization. But there is more to come. The 2°C – aim, respectively energy autonomy, is only reachable when energy and resource consumption is decoupled from economic growth. Besides, it has often been neglected within climate discussions that this goal is interlocked with other fundamental questions (like north-south justice, nutrition, biodiversity, chance of prosperity for all). Technological concepts alone cannot reach this ambitious goal. It crucially regards questions of value systems. Only through fundamental changes in behaviour energy independence can be achieved.

Dr. Adi Gross, head of energy department and programme manager of "Energy Autonomy Vorarlberg" stresses that "… this means that even if at first glance it is not obvious, energy autonomy is both a cultural, but also a social project".

ALPSTAR – MAKING BEST PRACTICES MINIMUM STANDARD

Currently there are several approaches on the one hand to achieve the energy goals and on the other hand to communicate climate change to dedicated target groups. One of these approaches is

the participation in the Alpine Space project ALPSTAR. The project is addressing the need for well-directed and cross-cutting action to effectively manage climate change and reduction of climate-damaging emissions in the Alpine region, which was expressed by the Action Plan on Climate Change in the Alps (10th Alpine Conference) and Interlaken 1st ASP expert workshop Coping With Climate Change. For this purpose the project partners are elaborating climate action plans for their specific regions and they implement good practices in their so-called pilot region. The project benefit for Vorarlberg is manifold. On the one hand project partners can learn and adapt good practices from each other. Besides, Vorarlberg is launching a cross-border pilot project in the field of commuting mobility. New and innovative approaches about "how to change commuting behaviour" will be elaborated, tested, implemented and evaluated.

ENERGY INSTITUTE VORARLBERG

The Energy Institute Vorarlberg is one of the main actors in implementing the strategies in line with the primary goal of becoming energy autonomous until 2050 and is also subcontractor of the Provincial Government Vorarlberg in the ALPSTAR project. The main two pillars of the Energy Autonomy programme are on the one hand the further increase of renewables and on the other hand a significant improvement in energy efficiency. These two pillars are guiding principles of the institute from the beginning.

The mission of the Energy Institute Vorarlberg is to advise, educate and research into the efficient use of energy and renewable energy sources. The main goal is to positively influence the key success factors of sustainable energy systems in the short and long term. The Energy Institute Vorarlberg focusses on efficient energy use, the utilisation of renewable energy sources, environmentally sound building methods and sustainable transport policies. The main target groups are, therefore, the residents of Vorarlberg, local authorities, industry and SME's and also professionals from the building sector.

Energieinstitut Vorarlberg
Stadtstrasse 33 / CCD
A - 6850 Dornbirn
+43 (0)5572 / 31 202-90
+43 (0)5572 / 31 202-4
info@energieinstitut.at
www.energieinstitut.at

DI Josef Burtscher, Managing Director, states rightly that "the Energy Institute brings energy autonomy to the people and supports its success." ●

DI Josef Burtscher, Managing Director Energy Institute Vorarlberg

Dr. Adi Gross, Head of department for Energy, Climate Protection and Efficient Resource Use Vorarlberg Provincial Government

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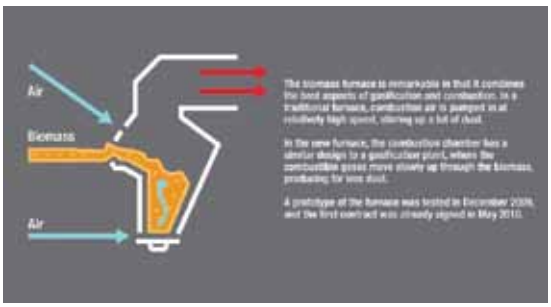
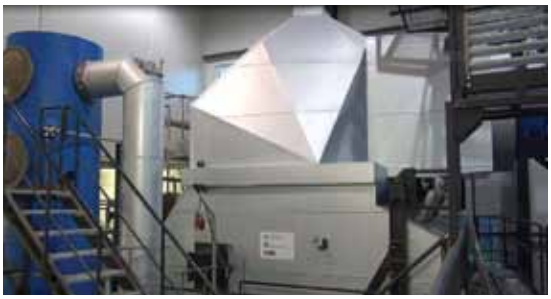
Jens Dall Bentzen wins the European Inventor award 2011.





8 MW heating plant in Bogense, Denmark.

Acknowledgement: The development of the Dall Energy Technology has been supported by the Danish Energy Agency and The Danish Agency for Science, Technology and Innovation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