WINTER 2015

european energyinnovation

European Energy Innovation

SMART CITIES
E-MOBILITY
ENERGY STORAGE
COP21

Winter 2015

Includes editorial contributions from:

Dominique Ristori
Director-General for Energy,
European Commission

Kathleen Van Brempt
Vice-President,
S&D Group,
European Parliament

Anna Lisa Boni
Secretary General,
EUROCITIES

International Conference

World Sustainable Energy Days **2016**

24 - 26 February 2016
WELS, AUSTRIA

CONFERENCES:

- European Nearly Zero Energy Buildings Conference
- European Energy Efficiency Watch Conference
- Energy Efficiency Services Conference
- Smart Facade Materials Conference
- European Pellet Conference
- Young Researchers Conference: Energy Efficiency & Biomass
- Tradeshow "Energiesparmesse"
- Cooperation Platform
- Technical Site Visits
- Poster Presentation

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As one of Europe's largest annual conferences in its field, the World Sustainable Energy Days have grown over the past 20 years into a global meeting place for the sustainable energy community.

Each year, the unique combination of events attracts experts from all over the world to Wels, Austria. In 2015, over 750 energy experts from 64 countries took part in the events.

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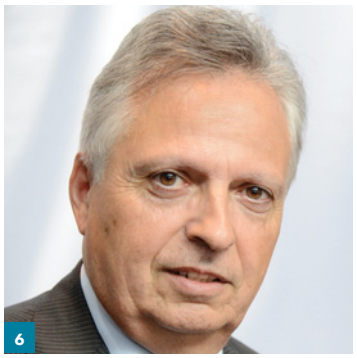
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GAS TURBINE CENTER

The Gas Turbine Center is an investment performed within the "Modernisation and construction of the new research and development infrastructure of the Military University of Technology and the Warsaw University of Technology for the requirements of common numerical and experimental research on aviation turbine engines", co-financed from the European Regional Development Fund under the Operational Programme Innovative Economy 2007-2013.

GRANTS FOR INNOVATION

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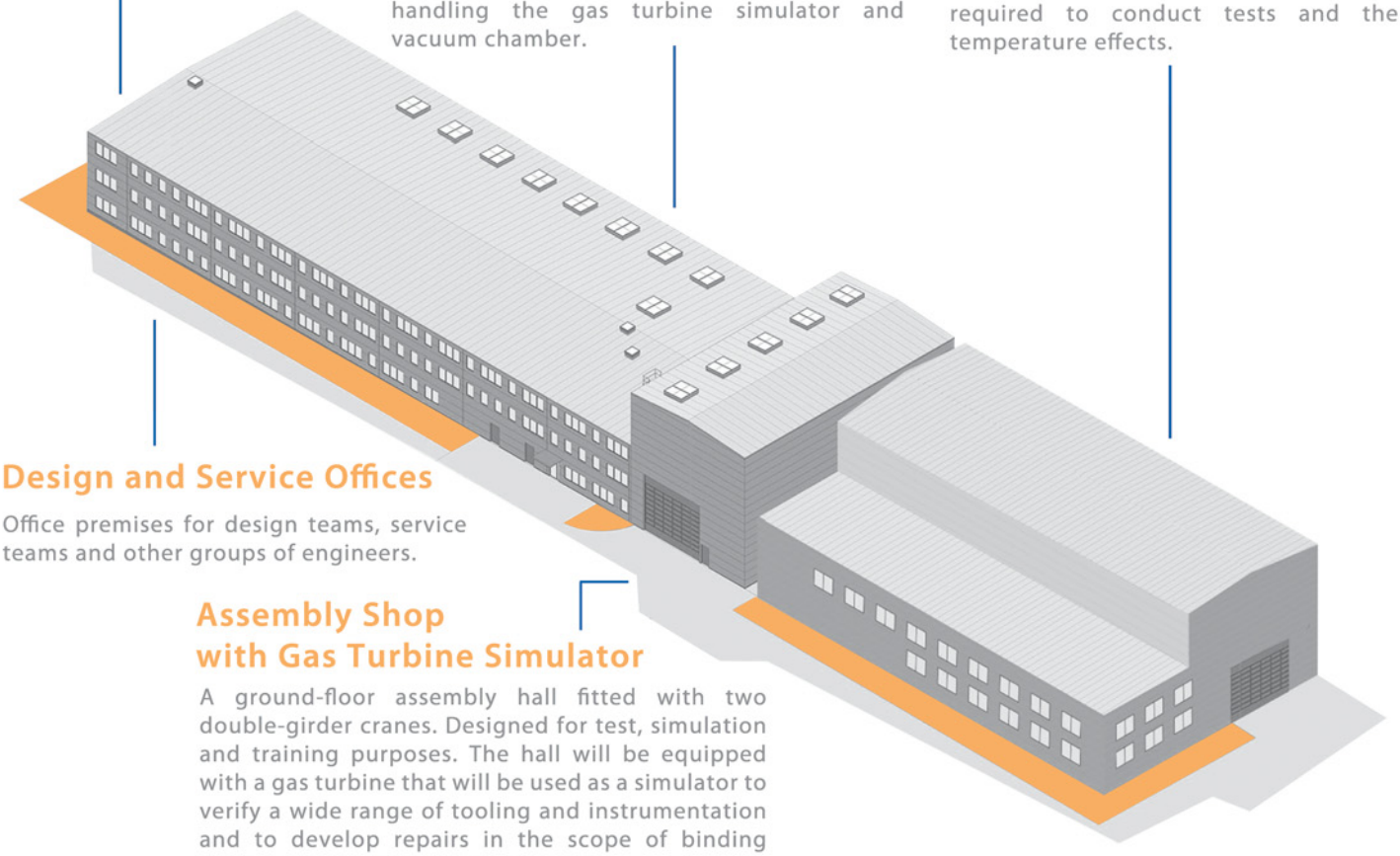
Repair Shop

Ground-floor hall fitted with two cranes. Specially designed for assembly work, welding and soldering work and welding and sanding work. The hall equipment includes processing machines, cutters, as well as a coordinate measuring machine. All the hall facilities will be harnessed to create tooling and instrumentation prototypes for turbine inspection, repair and servicing and for handling the gas turbine simulator and vacuum chamber.

Vacuum Chamber

Station for the performance of studies on ventilators and rotating parts of turbine engines. Equipped with a 6 MW electric drive and vacuum pumps. The chamber will enable testing to be conducted on static and dynamic load characteristics of the tested object at speeds of up to 12K RMP. The vacuum environment is intended to minimise the power required to conduct tests and the temperature effects.



Design and Service Offices

Office premises for design teams, service teams and other groups of engineers.

Assembly Shop with Gas Turbine Simulator

A ground-floor assembly hall fitted with two double-girder cranes. Designed for test, simulation and training purposes. The hall will be equipped with a gas turbine that will be used as a simulator to verify a wide range of tooling and instrumentation and to develop repairs in the scope of binding (e.g. welding, soldering and sealing).

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Foreword

Despite the ghastly and seemingly inexorable progression of events in the Middle East, upon Europe's borders and, most recently, within one of its capital cities, it has become difficult to ignore the theme of transport in these final weeks of 2015. It has recently featured in the headlines for all the wrong reasons, but if the VW scandal draws attention to automotive emissions, particularly as COP21 is convened, then some good may come of the story. And transport and emissions are both well represented in this issue, in which we are delighted to feature an article by Dominique Ristori, Director-General at DG ENER. He observes that, since over 70% of Europeans live in cities, accounting for around 70% of our energy consumption, these concentrations of people are the perfect laboratory for cutting emissions, increasing the use of renewable energy and improving energy efficiency. Discussing the crucial role of energy efficiency, he signals that two EU Directives will be reviewed next year within the context of the Framework Strategy for Energy Union. He also discusses the importance of the Horizon 2020 Smart Cities and Communities Lighthouse projects in improving the quality life for those who live in cities; and looks to future ambitions of decarbonisation. Followers of the dieselgate story please note. Echoing this theme, Anna Lisa Boni discusses how cities are turning to digital technologies to improve services, reduce costs, save resources and engage more effectively with citizens. She reviews EUROCITIES' involvement with 130 major European cities and several EU-funded projects, including the Green Digital Charter, CITYkeys, OPTICITIES, and TRANSFORM. Writing that "A smart city is a district energy city", Dana Popp explores the construction and expansion of smart district energy networks, that integrate renewable power into district heating and cooling. Providing a parliamentary perspective Herbert Reul, MEP explains how Smart Mobility involves integrating many modes of transport into one system but that the regulation of digitalisation should proceed wisely and carefully: it too should be smart. Interestingly, Mr Reul is not an advocate of strict emission targets in the transport sector: followers of the dieselgate story please note. Digitalisation provides the focus of Ana Aguado's discussion of trends that are driving distribution system operators (DSOs) towards deployment of smart grids. Interestingly, she observes that the regulatory environment is not always conducive to network predictability.

As if to provide a backdrop all these efforts, Kathleen Van Brempt provides a fittingly sombre assessment of the importance of COP21. Stating flatly that the significance of the Paris summit "can hardly be underestimated", she underlines the importance of limiting global carbon emissions as part of a strategy to counter "self-reinforcing global warming" and "dramatic climate change". In this context, Frédéric Boyer indicates how the Covenant of Mayors can facilitate the efforts of cities and reinforce their commitments to emissions reduction.

And if you look at only one other document after reading this magazine, make it Tanya Somanader's "Why We Have to Act on Climate Now -- In One Chart".

But before you do that, there is much more to read inside…

Michael Edmund
Editor

Smart Cities: energy efficiency and more

By Dominique Ristori, Director-General for Energy, European Commission

Today, 360 million of us live in European cities – that is more than 72% of EU population. The shift from rural to urban areas takes place at global level. That urbanisation brings with it as many opportunities as it brings challenges. And nowhere is that truer than for energy. Cities currently account for 70% of our energy consumption while around 50% of our energy bill comes from the heating and cooling of buildings alone. That makes cities and urban areas the perfect laboratory for cutting greenhouse gas emissions, increase the use of renewable energy and improve energy efficiency. That work has already started.

URBAN AREAS: A FOCUS FOR EU ENERGY POLICIES

Building on the existing objective of 20% energy savings by 2020, last autumn European leaders agreed to a collective energy efficiency target by 2030 of at least 27%, to be reviewed by 2020 having in mind an EU level of 30%. The Framework Strategy for Energy Union[1], presented by the Commission in February this year, has confirmed the principle of "energy efficiency first" and has put in place tools and instruments treating energy efficiency as a source in its own right. The regulatory framework accompanying energy efficiency is being strengthened through the revision of products related legislation, followed by the review of Energy Efficiency Directive and Energy Performance of Buildings Directive next year. Energy efficiency projects are among top priorities for the recently launched European Fund for Strategic Investments as well as under the European Structural & Investment Funds (ESIF). Furthermore, significant funding for research projects related to energy efficiency is made available.

The CONCERTO initiative, for example, invested €175 million of EU funding in 58 innovative projects focusing on integrated energy production in Europe – from using more renewable energy sources, to moderating energy demand in new or renovated buildings. The results from these projects fed into the 2010 Energy Performance of Buildings Directive and the 2012 Energy Efficiency Directive; and between 2010 and 2013, a number of measures were implemented under the Energy Efficiency in Buildings public private partnership.

Moreover, since 2014 the Horizon 2020 programme (2014-2020) has been taking EU efforts on urban areas one step further with the so-called Smart Cities and Communities Lighthouse projects. The idea that inspires them is to bring together a number of flagship cities using innovative solutions to inspire others. Reinforcing synergies between the energy, transport and telecommunications is key in our transition to a low carbon economy.

SMART CITIES TO IMPROVE QUALITY OF LIFE

Smart cities and Communities Lighthouse projects successfully combine energy efficiency measures for buildings with the use of renewable energy sources such as solar and wind, as well as computer-enabled energy

Lead and follower cities in the 2014 Call for Proposals on Smart Cities and Communities Lighthouse projects

management systems. They are an example of how waste and biomass can be useful in district heating systems, or how heating and cooling can be provided by water sourced heat pumps. And they go beyond energy by integrating the transport network: a sector with a strong potential to decarbonise cities.

In a nutshell, these projects are a powerful tool to improve urban quality of life. Ensuring comfortable housing with a moderate energy bill, allowing inhabitants to use clean transport and enjoy streets lit with energy-efficient lighting are only a couple of examples. These projects often join forces with other projects that enhance quality of life in the suburbs, for example, by transforming former industrial zones or adding shops to residential areas.

That is why we are convinced that these initiatives will make a strong impact in many cities and communities in the next five years. That is in large part thanks to the Horizon 2020 program, which has earmarked close to €6 billion for energy research, as well as ESIF which can support such projects.

MORE AMBITION, BETTER RESULTS

Such a sizeable commitment is however not enough. EU-funding can support the development of power sources and assist in resolving any initial stage problems, but this, by itself, will not be enough to demonstrate the effectiveness of the projects. The key to a large-scale market success is the wide replication of solutions across the European Union.

Therefore, we are also pursuing policy initiatives to promote these measures, as well as exchanging best practices and experience among cities in Europe, for example with the Covenant of Mayors: a powerful forum that has gathered signatures from more than 6,600 cities worldwide and represents 211 million inhabitants -- a real pathway to promote Smart Cities and Communities solutions, and to help cities to achieve their ambition of decarbonisation. Building on that success, a new Integrated Covenant of Mayors for Climate & Energy for 2030 was launched on 15 October.

The European Commission is fully committed to improve the well-being of inhabitants and the capacity of the cities to boost local economies and create jobs, and keeps on developing policies in this direction. Let's now all bring our efforts together in the transition towards a low carbon, energy efficient city.

1 COM(2015) 80 final

In Paris we have an appointment with history

By Kathleen Van Brempt (pictured) is vice-president of the S&D group in the European parliament

The importance of the Paris climate summit can hardly be underestimated. It will be one of the last opportunities to avoid dramatic climate change. To counter self-reinforcing global warming, we must limit temperature rise to a maximum of 2° C above pre-industrial levels. To reach that goal, global carbon emission cuts of 40 to 70 percent - preferably at the upper end of that target - are needed by 2050 and we should stop using fossil fuels altogether by the end of the century.

If we fail, we should expect a cascade of environmental disasters, eroding biodiversity, melting ice caps, rising sea levels, desertification, more intense floods and hurricanes, crop failures... Such catastrophes will trigger massive migrations which will dwarf the current refugee crisis. In a few decades Europe could be faced with up to 200 million climate refugees. The ecological, economical and social disruptions will affect not only our societies but even life on our planet.

Can the Paris Summit reverse this trend? Previous controversial climate conferences often turned out to be disappointing. Think of Copenhagen. The Kyoto Protocol and some of the implementing agreements were admittedly called diplomatic successes, but they never became the crucial turning point to stop carbon pollution. Since 1990 global CO2 emissions have increased by 58 percent.

LEAPFROG

But things are different now. The Kyoto Protocol still bears the indelible stamp of the economic order of the nineties, in which the world was sharply divided into developing and industrialized countries. Only the latter committed themselves to binding agreements. Today, this dichotomy has faded. More than half of the emissions come from emerging economies such as China, India, South Africa or Brazil. The Paris summit will outline the blueprint for a new climate policy in which all countries engage in climate efforts, according to their own capabilities and responsibilities. All countries were invited to deliver national commitments at the UN.

More than three quarters of them - accounting for more than 90 percent of global greenhouse gas emissions - have done that. Emerging economies retained the right to 'dirty' growth for a long period of time, just as the Western world did before them. But now we see a shift in policy and thinking. Cheaper clean technologies and local problems with air pollution have caused countries like China and India to leapfrog towards sustainable solutions. Rural areas are instantly provided with local renewable sources of power, without using the intermediate step of centralized energy production based on polluting coal.

FINANCING FOR CLIMATE

The 'old' industrial world still has a historical debt to pay off. In Copenhagen we therefore agreed that developed countries would set aside up to $ 100 billion annually to finance climate actions in developing countries. That will be quite a challenge. European social-democrats have insisted on using alternative means of financing. This would include a financial transaction tax, a share of the proceeds from the auctioning of emission rights in a reformed emissions trading system or a tax on emissions from international aviation and shipping. Taxing emissions from aviation and shipping can help greening the transport sector as well. This is necessary because they emit as much as Germany and South Korea together and will keep on growing in the coming decades.

THE EUROPEAN AVANT-GARDE

Europe should not be ashamed at the Paris negotiating table. On the contrary. The EU will reach the 20 percent emission reduction target by 2020 easily. At the moment European emissions are already 23 percent lower, while our economy has grown by 50 percent since 1990. The 20-20-20-policy has been the driving force behind the development of the European Clean Tech industry, which employs more than 4.2 million people and continued to grow during the crisis years. But European world leadership in clean technology has still not yet been achieved. In 2013, for example, China invested more in renewable energy than the EU. To secure our leading position in Clean Tech and reach an ambitious agreement in Paris, Europe should strengthen its

climate ambitions and energy policy even more. A more ambitious European policy must ensure that the enormous pool of underutilised talents and the enourmous surplus in savings can shape a new economy in a wave of innovative and sustainable investments, which will finally end our coal-, gas- and oil addiction.

Investing in research and development, renewable energy and energy efficiency, rather than spending money on the imports of fossil fuels, will not only benefit trade, climate and air quality. It will create additional jobs and develop new technologies that can be exported. New technologies will make it possible to permanently end the carbon era. Not because we would run out of coal, natural gas or oil, but because there are cleaner and cheaper alternatives. After all, the Stone Age did not end because humans ran out of stones.

TOWARDS A "TRAGEDY OF THE ATMOSPHERIC COMMONS"?

A hearing in the European Parliament with UN climate chief Christiana Figueres showed that the current pledges committed to will lead to a temperature rise of 3° C, which is still far from the 2° C science is asking us. The Paris Agreement would solve this with a periodic strengthening of national efforts. Whether this will work is still questionable. Our Westphalian nation-state system, which acknowledges the nation state as the highest sovereign authority, is tested to its limits. If national realpolitik – with its freebooting tendencies – continues to force us into a global "tragedy of the atmospheric commons", we can only conclude that the system is bankrupt. That leaves us with only one institutional revolution of "biosphere politics" based on the sovereignty of the earth. It's time to wake up. Paris s'éveille.

Automotive industry needs a nudge in transitioning to electric cars

Zero-emission vehicles are EU's fastest option for reducing CO_2 emissions

AMSTERDAM – If the EU wants to achieve its climate goals, all newly sold passenger vehicles need to be electric from 2035 on. The fastest track to achieving zero emissions is to impose stringent, tradable CO_2 standards in the years leading to 2035, supplemented if needed by CO_2 bonuses (super credits) or even a quota system for manufacturers.

In 2050, the European transport sector has to emit 60% less CO_2. Since heavier trucks, aircraft, ships and trains will still partially use fossil fuels, passenger cars will need to be CO_2¬ emission free by that year. This means that zero-emission vehicles (ZEVs) will have to replace the current cars that have combustion engines. ZEVs are (generally electric) cars that run on a battery and/or fuel cell and do not emit CO_2 themselves. In order to achieve a full replacement of combustion engine cars by ZEVs by 2050, all newly sold cars will need to be ZEVs by 2035, because cars stay on the road for about 15 years after their initial purchase.

"If we take the zero-emissions objective seriously, ZEVs are the best option. In that case, the EU will have to keep imposing stringent standards on CO_2 emissions from passenger vehicles after 2021," conclude Omar Usmani and Marc Londo from the Energy research Centre of the Netherlands (ECN), who were asked by the Netherlands Ministry of Infrastructure and the Environment to evaluate the situation.

Test emissions per vehicle have already dropped sharply in recent years. In 2015, new cars are subject to a limit of 130 grams of CO_2 per kilometre driven. In 2021, this limit will drop to 95 grams per kilometre. There are currently two options on the table for 2025: 68 or 78 grams per kilometre. In order to reach zero grams per kilometre in 2035, it would be more logical to introduce the lower limit, according to ECN's estimates.

More stringent standards for CO_2 emissions per kilometre driven allow electric cars to better compete with cars that have a combustion engine. In the long run, it will become impossible for traditional cars to comply with the CO_2 requirements and manufacturers will be forced to switch to ZEVs.

Manufacturers already face potential fines amounting to millions of euros if the average emissions from the cars they sell exceed the EU limit. To promote the production of electric cars even more, Brussels could offer manufacturers CO_2 bonuses – known as super credits. "For example, each ZEV could count towards total average emissions with a weighted factor of 1.5. That makes production financially more appealing, even though safeguards would have to be built in to prevent abuse," Usmani and Londo state.

The limit for CO_2 emissions could also be made tradable. "That encourages specialisation in the market, where manufacturers that are good at it can make ZEVs and other manufacturers can focus on making cleaner cars with a better combustion engine," the researchers say.

Another policy measure is imposing quotas, which make it compulsory for every manufacturer to produce a certain number of electric cars. ECN sees this as a way to promote mass production and bring down the price of ZEVs. These quotas could also be tradable.

According to them, the EU should not incorporate CO_2 emissions from passenger transport into the current ETS system. The CO_2 price in ETS is so low that the measure would not provide a strong enough incentive to switch to ZEVs.

Waiting for country-based incentives from the national climate objectives (ESD) is similarly fruitless. "There is a risk that the transport sector would make less efforts if other sectors, like housing or agriculture, were able to save more CO_2," the researchers explain.

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Clean Energy Partnership CEP

A lighthouse project within the National Hydrogen and Fuel Cell Technology Innovation Program (nip)

Hydrogen mobility picks up speed

By Claudia Fried, Clean Energy Partnership Spokesperson, Berlin

October 2015: The Toyota Mirai has arrived in Europe. The first fuel-cell vehicle to be built in series production is focusing attention on the current state of H_2 infrastructure in Europe. Thanks to the Clean Energy Partnership (CEP), Germany will have 50 hydrogen filling stations by 2016.

Since 2002, government and industry have been working on emissions-free mobility without restrictions on range within the framework of the Clean Energy Partnership (CEP) demonstration project. Practical tests with hydrogen-powered cars like the Mercedes-Benz B-Class F-Cell have proved very successful to date. The CEP partner Toyota is currently delivering the first series-built fuel cell vehicles to customers in Europe. Honda and Daimler will follow with new models in 2016 and 2017, respectively. Hyundai has already been offering customers a small series of the ix35 Fuel Cell since 2014. And BMW, Ford, GM/Opel and Volkswagen continue to work with great dedication on hydrogen technology. In Hamburg, Stuttgart and Dusseldorf, fuel-cell buses are being used in local transport.

The task at hand now is to establish a network of hydrogen filling stations. By the end of 2016 there will be least 50 hydrogen filling stations by linking key German metropolitan areas and providing important transport axes to the whole of Europe. It is already possible to drive a hydrogen car from Stuttgart or Munich to Italy. CEP filling stations in North Rhine-Westphalia form an important axis towards the Netherlands and Belgium, which will eventually extend to Britain and France. In the north, besides the stations in Hamburg, another corridor of filling stations is being built towards Scandinavia. The CEP is collaborating with other projects funded by the European Union such as the H2ME, HyFive and New IG, to ensure that the knowledge gathered in Germany on the operation of filling stations and vehicles is passed along to our neighbouring countries in Europe, and that hydrogen-powered traffic flows across borders.

The production of hydrogen from renewable sources is essential for CO_2-free mobility and the storage of volatile electricity from solar and wind power. To eliminate the need for wind farms to be limited at peak times and ensure that electricity grids are not overloaded Electrolysis can be used to convert electricity into hydrogen power. The Enertrag hybrid power plant in Berlin as well as on site electrolysers already supply filling stations with renewable hydrogen. In the energy industry, hydrogen as a way to store electricity can help the electricity, heating, and transport sectors to grow together. This enables independence in the supply of raw materials and helps Europe achieve its environmental objectives.

To further expand the infrastructure to initially 400 filling stations in Germany the company H_2 Mobility was established. German Transport Minister Alexander Dobrindt recently held out the prospect of continued support for these plans. Efforts in the other European countries are also on the increase. The chances of a sustainable transport industry are good and hopes are growing that hydrogen mobility will be able to steadily increase its range in Europe.

www.cleanenergypartnership.de

Electrification – a key solution for a decarbonised Europe

By Hans ten Berge, Secretary General, EURELECTRIC (pictured)

A common challenge facing industry, policymakers and customers in today's energy world is: how to cost-effectively decarbonise Europe. Heating and cooling in EU buildings and industries constitutes 50% of our energy consumption. Together with 32% for transport, they represent the largest shares of energy demand across Europe. Currently, 85% of heating and cooling is produced from fossil fuels. This means that there is a vast potential to both decarbonise and save fuel. While some options to this are widely known, such as electric vehicles (EVs), much more can already be done, especially if we look at the overall potential of electrification.

REVEALING ELECTRICITY'S TRUE VALUE

In considering the true value of electricity as a means to achieve a decarbonised European economy, we must be clear that no other current energy carrier can decarbonise to the same extent and scale as electricity. Decarbonising electricity generation will make a major contribution to meet Europe's climate change targets. With the power sector fully committed to reducing CO_2 emissions by 80-95% by 2050, and an effective policy framework in place to ensure this goal, electricity is set to become the energy carrier of the future. Therefore, if used more widely, it also has the potential to decarbonise other sectors, which currently have no prospect of becoming fully sustainable.

ELECTRIFY AND BENEFIT

Electrifying heating, cooling and transport with power from decarbonised sources reveals a wide range of benefits which are critical in the transition to a sustainable economy in Europe.

One of the key benefits of electrification is that it helps meet the world's energy needs with less carbon. Using electricity for local heating in buildings and cities would not only reduce CO_2 emissions, but it would also cap the emissions of the heating sector by de facto bringing them under the EU Emissions Trading System.

Currently, there is widespread perception that improving energy efficiency implies reducing electricity consumption. However, recent technological developments have completely reshaped the comparative efficiency of electricity use versus the use of other energy vectors (e.g. gasoline, natural gas, oil). Therefore, the use of more electricity can actually result in increased energy efficiency. For example, changing an oil burner with a heat pump can, on average, save almost 50% of annual primary energy consumption. In road and rail transport, the numbers are just as impressive.

In urban areas in particular, electrification can also have significant environmental benefits. Electricity in transport and heating can reduce air pollution in our cities, especially when it comes to local pollutants such as particulates, NOx, SOx, VOCs and ozone. The use of electric buses, trains and light trains can drastically improve the air quality, traffic congestion and noise pollution. Beyond cities, electricity can also replace fossil fuels in small and medium enterprises (SMEs). This will allow concentrating energy related emissions to those remaining electricity producing plants with more efficient pollution abatement systems that will primarily be used as back-up for carbon-neutral generation. Therefore, switching from direct use of fossil fuels to electricity enables energy users to meet energy needs through zero emission energy (solar, wind, hydro, geothermal, nuclear etc.).

Since power can be produced from many different sources, electrification allows greater flexibility, and in return, this will further strengthen the security of supply. At the same time, electrifying final energy consumption could increase storage opportunities. The use of electric vehicle batteries or electric appliances (e.g. water heaters) as flexible demand and decentralised energy storage will allow higher renewable penetration and increase the reliability of electricity supply.

Finally, all the benefits mentioned above have direct positive impacts on the consumer. The use of electric vehicle batteries or electric appliances means that customers will no longer rely on fossil fuels and their volatile prices. Moreover, the development of demand response options for consumers make electric solutions more valuable compared to fossil fuelled alternatives. Electrification empowers the final consumers by giving them the opportunity to influence their bill and be in control of their consumption.

TECHNOLOGICAL ENABLERS ARE A REALITY

The good news is that the technologies enabling electrification are a reality. They already exist on the market or are getting ready for mass deployment (e.g. electric vehicles, heat pumps, smart technologies controlling energy consuming appliances, and direct heating based on low carbon generation). However, we must ensure that these technologies live up to their potential and help transform the energy system. While there have already been some positive policy signals, such as the strengthening of the EU Emissions Trading Scheme (EU ETS), much more progress is possible in the right policy landscape.

POLICY DRAWBACKS AND OBSTACLES

Despite policy developments, electrification and its direct and indirect benefits continue to suffer from a general lack of recognition or even a straight blockade of technologies involved. One major obstacle, which remains to be tackled, is related to the additional energy costs placed on electricity bills. These make electricity more expensive to customers compared to fossil fuel alternatives. It is therefore crucial to develop smarter financial instruments to increase private investment in new technologies that can replace old ones. Moreover, further factors enabling electrification, such as innovation and smart grids, need to be recognised so that new technologies can be pushed forward.

Without a doubt, the electrification of transport and heating is a very promising pathway. However, the policy obstacles indicated above need to be addressed as soon as possible. The choices we make today will determine whether we reap the potential benefits from electrification in 10 years, or whether we continue to consume large quantities of fossil fuels in our buildings and means of transport for another generation. If we are serious about decarbonisation, and the power sector is, unlocking electrification's potential will multiply its benefits for society and the environment. EURELECTRIC, sector association representing the common interests of the electricity industry at pan-European level, has made electrification a top priority in its agenda and will publish further reports supported by quantitative data.

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eMI³ launches its first standard specification taking a step closer to enabling interoperability across EV products

Delivering a turbo-boost to their vision of unlocking seamless electric vehicle (EV) driver experiences by enabling interoperability across EV products and services, eMI³ (e-Mobility ICT Interoperability Innovation Group) launched its **first standard specification**.

Focused on presenting the EV market place with a first set of industry agreed standardized use cases and business objects, the coalition of EV market players behind eMI³ hope to deliver an innovation and interoperability boost to this important and growing sector. Interoperability matters to this sector as it means the speed at which new products and services which enrich an EV driver's experience can be accelerated. In practical terms, interoperability means EV users should be able to use any charging point, in any country and benefit from any service from any supplier with ease and simplicity because cross-device communication is enabled.

Therefore, the delivery of this first standard specification marks an important milestone for the EV sector and arrives as a product of cross-sector collaboration. eMI³ itself boasts a membership of over twenty internationally focused EV product and service providers ranging from car makers, original EV equipment manufacturers and utilities, and is growing. The fact that this specification is a collaborative end product should not be understated. It serves to emphasise the innovation potential that can be released when conventional sector boundaries and mind-sets are crossed for a common goal – in eMI³'s case interoperability across the EV eco-system.

The goal of delivering interoperability, which is central to eMI³ and its members' mission and vision, is strategically important to the growth prospects of EV's globally and their contribution to fighting climate change. To promote this vision and to highlight the challenges facing the delivery of interoperability, eMI³ has also launched its **proposal for unlocking interoperability in the European EV market**. In this paper eMI³ describe challenges facing eMobility in three main areas. For each specific challenge a short description and possible actions for the European Commission to consider is covered.

You are interested to work with us? Just join eMI³!
www.emi3group.com

Berlin – melting pot of electromobility

The German capital is off to a flying, sustainable start: No other region has more new companies and start-ups than Berlin. Many of which are in electromobility, such as smart solutions for charging lamps from ubitricity and ebee. Even young companies like eMio are showing pioneer spirit with e-scooter sharing. And Berlin is also internationally attractive, as demonstrated by the move of US company Local Motors. Using crowd engineering, innovative vehicles are designed and manufactured in small series using 3D printers.

The city has recognized the economic opportunities of sustainable mobility while offering the best conditions for their application: Berlin is not only the city of car sharing, it also has one of the best public transport networks in Europe. A network that is increasingly using electricity to run. With the conversion of the BVG line 204, Berlin is the first capital city with a wireless charging e-bus line. Four electric buses have been available for passengers in Berlin since the end of August. The ride can then even be evaluated via an app.

Intermodality and the intelligent networking of the different modes of transport will play an increasingly important role. "Particularly in view of current events, electromobility is an opportunity to restore trust in the automotive industry. The mobility of the future will be dominated by the interplay of a variety of sustainable means of transport, the integration of renewable energies, and their intelligent coordination. The question will no longer be, "Which means of transport will I buy?" but "What is the fastest, easiest and cheapest means of transport to get from point A to B?" Smartphones, apps and online services will be increasingly helpful. Electromobility fits perfectly into this type of locomotion," explained Gernot Lobenberg, director of the Berlin Agency for Electromobility (eMO).

Around 450 actors from all value-added sectors in the field of electromobility are already currently active in the capital region. In the Berlin-Brandenburg International Showcase for Electromobility alone, around 30 projects will test and demonstrate the application and suitability for everyday use of electric vehicles. Cooperation with international metropolis and regions in Europe, America and Asia are getting more important over the last few years. The most relevant issues are e.g. to buildup and establish a sustainable information and best-practise exchange with other cities and to develop cross-national mobility projects.

All the sustainable mobility threads are woven together by the Berlin Agency for Electromobility eMO, the central point of contact that advances electromobility together with partners from business, science and public administration.

Berlin is already a pioneer in innovative and sustainable mobility.

The importance of the development of the Smart Grids for the growth of electric mobility

By Joseph Beretta, Avere-France President, AVERE Vice president

Energy has always been crucial in the economic development of human societies. The industrial revolution, have each time as the association of a new energy pathway with a new technology of communication, as well as a new transportation mode. Thus in the 19th century was coal, train and telegraph, in the 20th century oil, automobile, and phone, today we see, renewable energies, low carbon vehicles (electric and hybrid car) and the internet.

Beyond being a simple industrial revolution, the energy transition must be carrier of a complete transformation of the energy/technology/communication system and electrical energy is at the heart of this change. This transition must be done taking into account the new constraints imposed by the technologies of tomorrow: renewable energy, electric cars and internet broadband.

So today the emergence of electric mobility is global, it must bring solutions to energy independence, climate change and air quality. We are at the beginning of this 3rd industrial revolution: renewable electric energy, electric connected and communicating cars.

But the electric vehicle is a complex ecosystem. For a long time, it has conditioned by emergence to the availability of the batteries. One realises now that other problems need to be resolved: recharging infrastructure, integration of charge stations in electrical networks.

France have around 63,000 electric vehicles in circulation, the million vehicles will surely reach between 2020 and 2025. An ambitious plan of development of public charging infrastructure is underway, 10 000 charge terminals are today installed.

As the market is still emerging, the impact of electric mobility on the grid today is very limited but we must wonder about the consequences of a massive EV deployment on the balance of the electrical network. The impact of refills depends essentially on the charging vehicle demand. In order to spread this power, it is possible to control it via the network. For this, we should go to the intelligent charge (Smart charging stations). These smart systems including refills at home in order to avoid the two traditionally observed peaks in the day and, in particular the late afternoon.

These Smart Grids could balance supply demand of the electrical grid to the batteries of recharge vehicles are already a reality at the level of a building; it is now time to upper at national network level. Electric vehicles and Smart Grids have the same challenges and constraints: reduction of emissions of CO2, security of supply, air quality and storage of electrical energy.

By correctly anticipating the development of electric vehicles and recharging infrastructure, it is possible to transform these constraints into future opportunities both for the electric network and electric vehicle.

The massive introduction of renewable energy such as solar and wind power demand application storage capability to treat the intermittence of these energies. The electric vehicle is parked 80-90% and connects it to the network. It is therefore possible to use the battery of the vehicle as a storage system for the network.

The electric vehicle will promote and optimize renewable energy integration and contribute thus to reduce CO_2 emissions and pollutant of electricity production which will improve environmental impact.

It is therefore a virtuous circle that will engage between the Smart Grids and electric vehicles. We could consider electric vehicle as the missing link between transportation and electrical network.

The future is therefore drawn, the Smart Grids are an indispensable condition for the development of electric mobility as well to avoid oversized power electrical network, to enable the integration of renewable energy and reduce the electrical kWh CO_2 content.

AVERE FRANCE

Avere-France, a national association bringing together more than 130 stakeholders in the field of electric mobility, works for more 30 years in the domain. As such, the association has a true expertise of electric mobility and its challenges. Our role is to meet our members' expectations, defend the sector and spur the expansion of electromobility.

Energycaps: High power and high energy lithium ion capacitor

A research project in the frame of Industry-Academia Partnerships and Pathways (IAPP) - Marie Curie Actions

The management of the electricity supply interruptions that can occur unexpectedly is vital for hospitals, telecommunication centers, airports, supermarkets, banks, tunnels or critical production plants. About 20 seconds are needed to start an additional electric generator of several megawatts (e.g., a diesel generator). To ensure the uninterrupted power supply (UPS), an intermediate device capable of delivering such a high power within a fraction of a second and keeping it up to about 20 seconds is needed.

Lead-acid battery has been meeting the demand of uninterrupted power supplies (UPS) at a megawatt scale for many decades. Its power to weight ratio is, however, very low and appears as major inconvenience.

Lithium-ion capacitors have recently emerged as an interesting alternative. Their competitive advantage over lead-acid battery is an important reduction of the device size. Compared to Li-ion batteries, Li-ion capacitors offer a better compromise between power and energy for this application.

This technology was identified as a new opportunity for SOLVAY to promote the products typically sold on the lithium-ion battery market. Li-ion capacitor could also be used to improve the fuel saving and reduce the CO_2 emission in hybrid vehicles.

A SOLVAY researcher sought for partners to the forefront in this field of research in 2010. Two academic teams (Poznan University of Technology, Kiev National University of Technologies and Design) and two small companies (YUNASKO from Ukraine and RECUPYL from France) were selected. They joined SOLVAY in the collaborative project "Energycaps", sponsored by the European Marie Curie funding program "IAPP" (Industry-Academia Partnerships and Pathways) with more than 2 million Euros.

The objective of the project is to demonstrate market perspectives of this emerging technology (Li-ion capacitors).

The project started at the end of 2011. It has a mixture of secondments (26 researchers, 143 months) and recruitments. Academic partners are involved in electrodes, electrolytes, separator and current collector development/optimization.

RECUPYL is currently developing a recycling process and assessing the environmental impacts.

YUNASKO develops a prototype of Lithium-ion capacitor. The device provides an energy density similar to that of lead-acid battery, a charging time as low as 1 minute, and a number of cycles and power capability improved at least by a factor of 100.

Solvay products have been used in the electrodes, the separator and the electrolyte mixture. According to YUNASKO, LiTFSI, produced by SOLVAY is the preferred lithium salt for Li-ion capacitor.

Electric bus in Nice (FR) powered without any fossil fuel and without cable (photo with courtesy of the "PVI company"). The bus gets the energy at each bus station within 20 seconds. This energy is currently stored in classical supercapacitor (also called ultracapacitors) and allows about 1km range (see: www.pvi.fr).

Coordinator and contact: Fernand.Gauthy@Solvay.com
www.Energycaps.eu
www.Yunasko.com

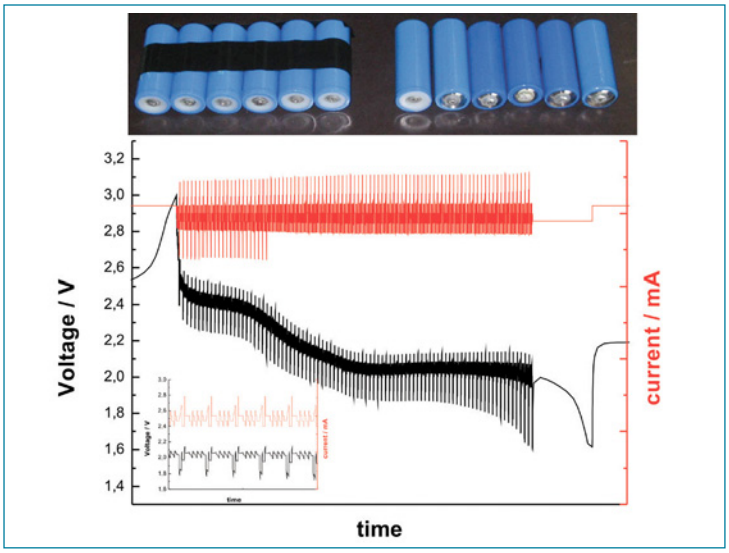
EUROLIS – Advanced European Lithium Sulphur Cells for Automotive Application

The on-going and foreseen increasing electrification of the transport sector is one of the major driving forces for new battery systems. The Li-ion battery (LiB) technology has advanced impressively in the last decades and according to the current state of the art, the available energy density is almost at the maximum limit, due to the intrinsic properties of the materials. New battery technologies with highly improved energy densities compared to today's LiB technology are therefore required. Among the different possibilities the most attractive is the redox couple between sulphur and lithium – the Li-S battery – which also is assumed to be the technology closest to commercialisation, in the near future. An energy storage based on Li-S batteries offers highly improved energy density made from inexpensive and abundant materials, which makes Li-S battery research strategically valuable for Europe. EUROLIS (www.eurolis.eu) is a European project aimed at sustainable and advanced Li-S batteries for automotive use. It is a consortium of 11 strong partners from 5 different countries. The intense collaboration between 7 research organizations (academia and knowledge transfer institutes) and 4 industrial partners (one SME, a battery producing company, and two OEM's) have so far resulted in the development of three generations of Li-S batteries based on materials and components made in Europe.

EUROLIS FOCUS: The project contains basic research at various levels. The development of new carbon host materials from the sustainable raw components with improved adsorption properties is the major focus of the research activities towards cathodes for high energy density cells. New electrolytes, additives and ion selective separators are developed with the aim to improve the rechargeability and to prolong the cycle life of the Li-S batteries. All the research and development steps are monitored with 6 analytical tools (4 of them in operando mode) developed at the beginning of the project. The analytical approach helps us to understand the mechanisms governing the Li-S cell in different electrochemical environments. Benchmarking of other Li-S technologies (all solid state batteries, flow batteries) is aimed at exploring other possible Li-S battery configurations. The applied part of the research is focused on the optimisation and integration of the materials into 18650 cells and cell testing for their appropriateness in automotive applications.

EUROLIS OUTCOME: The European chain of battery production line has been established where each partner has a particular role in the development and integration of the cell components into prototypes. Three different generations of the Li-S cells have successfully been produced at the prototype production line. Their electrochemical characteristics have been improved from generation to generation. The cells have been tested in different climate environments using different cycling regimes. We have demonstrated that the cells can be cycled under realistic EV profile (Dynamic Stress Cycling).

The project will finish in September 2016. Its continuation has been approved by EC with a new project HELIS (http://www.helis-project.eu/) where we now focus on performing ageing studies, ensuring proper safety, addressing recycling, and improving cycle life by implementation of effective separation and engineering of all battery components.



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Coordinator:	Robert Dominko, NIC, Ljubljana
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Main Partners:	Renault, Volvo, SAFT, Solvionic, NIC, CNRS, MPG, Chalmers, Elettra, Fraunhofer
Website:	www.eurolis.eu

Crisis? What Crisis?

By Mike Edmund

**"The Chinese use two brush strokes to write the word 'crisis.'
One brush stroke stands for danger; the other for opportunity.
In a crisis, be aware of the danger - but recognize the opportunity."**

John F. Kennedy, Speech in Indianapolis, April 12, 1959

Over half a century after this speech was delivered, two news stories shed light upon the clear and present danger represented by our current climate predicament; and, it must be said, upon the opportunity this also presents. Perhaps these stories cast particularly strong shadows; perhaps they throw Man's stewardship of the planet into ever-sharper focus. What is certain is that they are woven closely together into the backcloth of our attempts to avert a self-inflicted catastrophe.

The story first concerns revelations from Wolfsburg that VW has been manipulating the performance of its engines in an attempt to defeat emissions regulations. The second is the COP21 Conference in Paris, at which the world's nations are pledging to reduce those very emissions. Both refer to the central element of a plan to limit the rise in global temperatures to below 2 celsius degrees above pre-industrial levels. And, so far at least, there is plenty of evidence that the plan is not working very well[1,2,3]. However, even as it highlights the urgency of our situation, this concatenation of events may constitute a watershed for e-mobility in general; and for Electric Vehicles (EVs) in particular. And it may just put us back on the right road again.

Bellona's Director of Policy & Research Hallstein Havåg summed up the sense of anger and betrayal that many felt as dieselgate unravelled, when he observed[4] that "Volkswagen had the choice between making more efficient combustion engines or manipulating the performance of their engines to cheat the system, and they chose the latter option". Meanwhile, in its recent publication[5], the JRC recognised the importance of transport emissions as it examined e-mobility policies of two Member States in more detail. In the Netherlands, there are many tax exemptions for EVs, and regional/ municipality incentives such as infrastructure provision, purchase subsidies for fleet vehicles and free or priority parking. Elsewhere, the UK has implemented various policies, including subsidy (up to 25% of the vehicle purchase price), and an extensive infrastructure programme involving eight test regions.

The current approach may therefore reasonably be described as a mixture of carrot, principally in the form of subsidies and tax incentives, and stick (such as emissions regulations). However, the JRC has concluded[6] that, taken in isolation, subsidising infrastructure provision at an EU level has a "weak correlation" with early e-mobility uptake, while VW has demonstrated that environmental considerations may still be subordinated to business considerations. Perhaps, with COP21 taking place as I write, it is the right time to ask if there might be better integration of these two approaches; or even a better strategy altogether.

Perhaps such a question is premature: the recent Amsterdam Roundtables Foundation/ McKinsey Report[7] observes that Europe has gone through the initial adoption phase of electric mobility, a "turbulent" period of excitement, promise and disappointment. Nevertheless, the report states that global and European sales figures are still below 1% of new car registrations, albeit with much stronger performances locally: in Norway, the top-selling models in September, October, and December of 2013 were battery electric vehicles (BEVs). In November, EVs reached 12% of sales in Norway overall.

Elsewhere, there are many examples of advances in battery technology. Recent research[8] into the structure of lithium and manganese-rich transition metal oxides could yield materials that could potentially double the capacity of the most commonly used Lithium-ion batteries.

Meanwhile, revolutionary architecture[9] may allow batteries with five times more energy capacity than current batteries, transforming energy storage in previously unknown ways. It is less than a year since we learned of the development of the solid-state battery[10]. Any or all of these technologies offer potentially substantial improvements in EV performance, particularly that of extending the useful range between charges. Nevertheless, there is still a considerable gap between our energy-climate aspirations and the reality of our adoption of EVs. Writing for the thisismoney website[11], Hull argues that motorists in the UK are attracted more to the potential savings associated with lower running costs and taxes than they are to the environmental credentials of EVs. He quotes a study of over 1,500 motorists, of whom almost 20% were considering EVs. Clearly, the potential is there, but is not being realised. Perhaps, after all, that earlier question over EV strategy should indeed be pressed harder: and why not at COP21? The Bellona article[12] emphasised that "business as usual" for the automotive industry should not be allowed to continue. So another question: can something creative be done about VW's enormous debt to society? Could the automotive giant not be compelled in some way to advance the cause of EVs?

Unfortunately, although Kennedy's sentiments remain entirely appropriate to the current climate debate, his Chinese interpretation was not strictly correct[13]. A better alternative might be the compound word zhuǎnjī, which includes the concepts of "opportunity" and of a "turn for the better"[14]. So, with apologies to the late President, the Chinese word zhuǎnjī might just represent a perfect representation of the climate situation that confronts us today.

But, you note, the term implicitly requires a 'turn' – a change in direction.

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Doing more with less: smart regulation for the future

By Herbert Reul, MEP

The European Union is good in doing many things. What it is often lacking however is an understanding that overburdening regulation is harmful and less efficient than setting incentives. Regulation in the field of digitalisation is in its infancy, with many things just starting to be regulated now or where the previous regulation is decades old – from the pre-Smartphone age. There is hence an opportunity for a fresh start in many fields and this opportunity should be used wisely.

Digitalisation holds an enormous potential for many sectors. It is an opportunity for Europe to retain its wealth in the future. But the often untapped potential needs to be fully used. Regulation therefore must not prevent innovation and new business models from unfolding. The challenge for the European Institutions is to set the right framework for established companies and start-ups to grow and adapt to digitalisation, as well as to create future-proof laws that will last in this rapidly changing environment. Furthermore, consumer trust in new applications is crucial: users need to trust new applications, services or hardware in order to make use of them.

Digitalisation and all that comes with it can also be a new solution to old problems. In the transport sector it can help to reduce emissions, relieve problems of urbanisation and demographic change, and create more space on the roads to avoid traffic jams. Mobility is one of the basic needs of people living in modern societies. However, in the past years people have become increasingly mobile and want to go greater distances in shorter periods of time for less money.

Possible solutions to the above-mentioned problems through digitalisation can be summarised under the term smart mobility. Smart mobility is about connecting various modes of transport (cars, trains, busses, taxis, bikes) and integrating them into one system. A system, which enables the user to use his smartphone to check the quickest or cheapest way to his destination, to find the closest parking place, to book the tickets or pay the service in one place and to use it as a bike- or car-key. It is also about new ways and means of transport, such as connected cars. But smart mobility is also about choosing "smartly" when to move. Increasing flexibility of employees that can more and more often choose when to work (flexi-time) and from where (home office) enables people to get on the road when there is less traffic.

The key to make these concepts work is acceptance and effectiveness: it must be easy, quick, cheap and safe for the user to use an app to find a parking space, to use an electric car, an autonomously driving car, or to drive to work later as usual.

If smart mobility is a made success, its potential is huge: Preventing traffic jams, reducing the time it takes to find a parking space, and the use of electric cars in cities would help reduce emissions. Car- and bike-sharing would create more space on the roads. Autonomously driving cars would make the roads safer, prevent accidents, as well as give people more time to actually get things done while driving somewhere. Integrated multimodal door-to-door transport possibilities would also help elderly people that cannot drive themselves any more to be more independent.

From the regulatory side, these developments need to be accompanied wisely. I am convinced that strict emission targets in the transport sector in Europe are not the smartest way to reduce emissions.

Strict emission regulations are very costly for automobile


Herbert Reul, MEP

manufacturers. Funds that could be used to develop new ideas and services in the context of smart mobility are currently used to bring down the emissions of their fleet. I believe digitalisation of the transport sector will solve many problems, including reducing emissions from road transport. Therefore, it is crucial to develop solutions for smart mobility and to encourage research and development in this field. To enable scale effects, it is also important to create a system, where transport offers of different providers and manufacturers can be used interchangeably and are interoperable. A certain degree of standards must be set, that at the same time allows for innovations. In the transport sector, Europe could play a leading role in developing good innovative business models and best practices. Strict and painful regulation is harder to export than beneficial business models that spur the local economy.

Europe should tread very carefully when regulating in the digital sphere and that means doing more with less. Overregulating will hamper innovation. Innovation, such as in the field of smart mobility, in turn has a huge potential for solving existing problems. This holds true not only for the transport sector, but many others as well.

Lifting the range limitations of electric vehicles

By Jean-Baptiste Segard, Founder EP Tender.

DRIVING 100% ON FOSSIL FUELS, OR 98% ON ELECTRIC GRID CHARGING?

There is a legislative and environmental drive towards the implementation of EVs. However, they remain a niche market primarily due to their cost/performance ratio. One of the main culprits is the cost of the EV's range. EVs that offer significant effective motorway range (ca. 350 km) are prohibitively expensive and remain a niche high end product (e.g. Tesla). On the other hand EVs with limited range (ca. 100 km, e.g. Renault Zoe) suffer from buyer's "range anxiety" and thus also belong to a niche market.

It is noteworthy to point out a key difference between internal combustion engine (ICE) vehicles and EVs: for the former the fuel tank is one of the cheapest components (just a little more plastic); for the latter the batteries are the most expensive.

In electronics, cost has been optimized with batteries that provide power only for typical usage (a typical smart phone's battery lasts a single day). For extra power needs, external battery modules or chargers are used. Significantly, the consumer only pays for typical power use. In this way cost, weight and volume is optimized for common use. Who would purchase and carry a phone with a huge battery just for very occasional peak usage?

DISRUPTIVE INNOVATION: MODULARITY

EP Tender is proposing a paradigm shifting innovation for the transport sector: design EV for typical use and provide a network of energy modules (Tender'Lib) mounted on small trailers available to rent at the point of use (e.g. motorway service stations and commercial centres) for longer trips (ca. 600km). By providing a modular approach the consumer gains affordability, convenience and peak range whilst not sacrificing environmental credentials.

Energy storage technology is progressing at a faster rate than electric motors or other major vehicle component (cost/performance doubles every 10 years). As a result a key advantage to this approach is that the Tender can take advantage of technology progress and offer it to the consumer without the need to replace their vehicles.

The upcoming battery progress can also be mainly focussed on reducing the weight and the cost of EVs! They will thus reach a significant market share, without requiring high subsidies which would become unsustainable by the States.

At present EP Tender is based on an ICE, and will evolve to be based on fuel cells or very high density batteries as technologies mature. A full EV thus gets omni-hybrid capability when having access to EP Tender. H2 infrastructure deployment can thus

98% of time:

(360 days)

2% of time:

(6 days)

EP Tender

be progressive, and it can be used by affordable vehicles: this would be a major boost to H2 adoption!

Attaching the Tender to the car is achieved easily in one go, and the Tender will not knife jack when backing. This this video (https://www.youtube.com/watch?v=UnN4khtqa-U, or QR code link below) will give a good introductory view of the functioning.

We are launching in 2016 a field test between Paris and Rouen, with 50 vehicles and 5 Tenders. The Tenders will be available for on demand rental. Our launch clients are ERDF, the city of Rouen, as well as craftsmen and individuals. This field test is supported by H2020 and the French Investissements d'Avenir programmes. The wider commercialisation starts in 2017 in france and 2018-2020 for the rest of Europe, China and Northa America.

Contact details:
EP Tender
www.eptender.com

Automotive emissions: How are we to turn defeat into victory?

By Mike Edmund

"If we are victorious in one more battle with the Romans, we shall be utterly ruined" **- Pyrrhus of Epirus**

Some four centuries after the event, Roman historian Plutarch recorded this reaction of King Pyrrhus to a particularly costly military victory. Now, nearly two millennia later, the observation resonates uncomfortably with news that broke on the 18th September. The US Environmental Protection Agency (EPA) issued to German automaker Volkswagen Group (VW) a notice of violation (NOV) that referred to four-cylinder diesel engines. Something of a modern-day Pandora's Jar was opened 46 days later when this NOV was followed by a second one, referring this time to VW's six-cylinder diesel engines[1]. Much of the story is already well publicised, but some of its salient facts bear repetition here. At its heart is an allegation of the deliberate, sustained and systematic use of a so-called defeat device by VW in order to misrepresent the real-world performance of its engines with respect to emissions of oxides of Nitrogen (NOx). VW has by its own admission sold some 11 million of these diesel-powered trojan horses, vehicles whose emissions exhibit "A noticeable deviation between bench test results and actual road use"; and it has earmarked some €6.5 billion ($7.2 billion) to rectify the offending software[2]. VW's initial claim that the problem related only to its four-cylinder EA 189 diesel engine has since been revised[3].

There can be few reading this magazine who have not already formed an opinion of the story that has since unfolded. A story, indeed, that continues to unfold at a quite bewildering pace: almost daily there emerges some lurid new dimension to consider. An ICCT-ADAC Study[4] has found "a serious compliance problem for NOx emissions" among a range of current Euro 6 diesel passenger cars. Autocar Magazine[5] reported official statements from BMW, Ford, Mercedes, JLR, Peugeot, Citroën, Lamborghini, Bentley, Porsche and Renault that all deny emissions test cheating. VW itself has admitted "irregularities" in the CO_2 emission performance of engines fitted to a further 800,000 vehicles[6]. According to its official statement, "The majority of the vehicles concerned have diesel engines." Of course, "The majority" means "not all" and the EU Commission has now written to the 28 member states requesting them to investigate further[7]; and to VW to demand clarification[8]. There is also a growing sense that the story is spiralling out of control. What is the car-buying customer to make of it all?

Since this scandal is essentially about emissions (both carbon and nitrogen), let us pause for a moment for breath.

The first thing to establish is that this story matters. It *really* matters. Emissions regulations exist for a reason; and notwithstanding our efforts to limit CO_2 emissions to combat climate change, there is a catalogue of research that links NOx with excess morbidity and premature mortality. According to the European Environmental Agency's 2014 report[9], some 8-13% of the population of the EU28 (which currently numbers about 500 million people) is exposed to levels of NOx that are in excess of EU and WHO reference levels, while the US EPA suggests that even short-term exposure (from as little as 30 minutes) to one of the nitrogen oxides, NO_2, is associated with adverse effects that include airway inflammation in healthy people and worsened respiratory symptoms in people suffering from asthma[10]. A recent Swedish study[11] showed that residential exposure to even relatively low levels of NOx is associated with increased mortality; and that the longer the exposure, the greater the risk. So, though clearly not a trivial issue, it is equally clear however that VW is not *directly* responsible for any of these harmful effects, since its engines obviously are not the sole source of NOx in the atmosphere. Moreover, the science of statistics being what it is, it is impossible to identify *which* people will be directly affected, limiting the scope for class actions or lawsuits even in light of the recent highly damaging findings of Barrett *et al*[12], who calculate that "the excess emissions will cause 59 (95% CI: 10 to 150) early deaths in the US". For clarity, this refers to emissions as a result of VW's actions. Nevertheless, the estimated $450million social cost of these 59 deaths[13] is likely merely to be the starting point for assessing the ultimate financial impact of the scandal.

The second point to establish is that this story is clearly going to be expensive. *Really* expensive. Ultimately, how expensive is likely to be measured in company balance sheets and share prices, but it is the customers who drive these figures (and of course the cars; or not, if they so choose). A recent poll indicated that 71% of 8,500 users on a motoring magazine website now trust the Volkswagen brand less than they did before[14]. Conversely, a UK newspaper has reported much higher brand loyalty among Germans and a belief that the scandal has been exaggerated[15].

Significantly, over 90% of the respondents believed other carmakers were also probably manipulating emissions tests, and that VW was just the first to be found out. What is clear is that significant reputational damage has already been sustained by the VW brand in particular; and will be sustained by German engineering in general; and possibly ultimately by wider industry across Europe. Indeed, in addition to its previously-announced €6.5 billion, VW has added a further €2 billion to cover the "economic risk" attached to the more recent revelations about CO_2 emissions[16]. Meanwhile, Brand Finance has estimated the loss of value of the VW brand to be of the order of $10 billion[17], while the publication Industry Week assesses the potential loss to the value of "Made in Germany" to be as high as $191 billion[18]. Colossal figures, indeed; and it is salutary to remind ourselves that these dollar sums contain no calculation of the environmental consequences of the scandal; costs that will eventually be borne by all of us.

The German poll findings in particular require a third

point to be established: that this story is complicated. It is *really* complicated. Part of the background is the validity of the emissions limits themselves. Since September 2015, there has been a requirement that all newly-registered diesel passenger cars meet the Euro 6 NO_x emission limit of 80 mg/km over a prescribed certification cycle (the New European Driving Cycle, NEDC). When a recent ICCT – ADAC[19] study analysed the emissions performance of 32 Euro 6 cars from a range of manufacturers over both the NEDC and the Worldwide Harmonized Light Vehicles Test Cycle (WLTC), all vehicles except one met the 80 mg/km NO_x limit over the NEDC. However, they performed poorly on the part of the WLTC that lies outside the NEDC. The WTLC is thought to provide a more realistic representation of real-world driving and is expected to replace the NEDC. Put another way, the current crop of diesel cars meets the current regulations, but these do not represent real-world driving very well and will be superseded. Meanwhile, suspicion of "official" performance figures has recently extended into the domestic appliance market, where UK manufacturer Dyson sued German giant BSH Hausgeräte, which manufactures home appliances under the Bosch and Siemens brands, over the veracity of its energy efficiency claims. This was strenuously repudiated by the German company in a countersuit. Tellingly, when it dismissed Dyson's claims[20], the ECJ acknowledged that "the suction performance and energy efficiency of a vacuum cleaner with a dust-loaded receptacle will be reduced due to dust accumulation". There are clearly wider aspects to be considered here, which include the suitability and applicability of performance standards to the real world. And that is the point: a manufacturer who breaches the regulations must face the consequences; but who really benefits, apart from the lawyers, if the regulations themselves are next to meaningless?

Another part of the background is economic. Other German manufacturers are already mired in this scandal, and according to a recent Reuters article, Germany's auto industry accounts for roughly one in five jobs; and for 17.9 percent of Germany's 1.1 trillion euros in exported goods last year[21]. These figures dwarf even Industry Week's $191 billion assessment of the damage to the German brand. And this damage may ultimately translate into lost business, lost export and lost jobs. Punishment for VW's wrongdoing may not fall only upon the guilty.

So should we be angry about dieselgate? Absolutely. But should we be surprised by it? No. Mankind already has a long and undistinguished history of subordinating environmental concerns to business expediency. The anger and sense of betrayal were eloquently expressed by Bellona's Director of Policy & Research Hallstein Havåg, when he argued[22] that "Volkswagen had the choice between making more efficient combustion engines or manipulating the performance of their engines to cheat the system, and they chose the latter option". So should VW be punished? Yes; and severely, for it has surely forfeited the right to conduct business by its current standards. But does it serve Europe well to inflict upon VW such such sanctions as might drive them out of business altogether? Let us examine such a proposition briefly. Demand for cars surely would not evaporate suddenly. Customers (even German ones) would still be able to buy cars (even German ones). Therefore VW's workers (perhaps especially the German ones)

would be surely be able to find jobs elsewhere - those workers, that is, who are entirely innocent. But this nihilism is surely to waste an opportunity. Wendell Phillips once supposed that Defeat is "Nothing but education; nothing but the first step to something better". The total number of Electric Vehicles (EVs) on the road has recently passed one million[23]: what if, quite apart from setting right all the damage it has done, VW were to be compelled to put 11 million EVs on the road before it could sell one more conventionally-powered car? Or if it were required to finance the installation of appropriate electricity charging points at *every* petrol station in *every* market in which it has sold defective vehicles? What might we learn from such courses of action? It is said that Hope remained behind when Pandora opened her Jar: let us hope, then, to find a more productive solution than merely punishing VW; and let us not give future historians of this story cause to recall Pyrrhus' verdict of his victory at the Battle of Asculum.

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The transformation to smarter cities

By Anna Lisa Boni, EUROCITIES secretary general (pictured)

More than half the world's population now lives in cities. This figure is set to rise to 70% by 2050. When faced with rapid growth, it is up to local leaders and managers to ensure the liveability, sustainability and resilience of our cities. Cities are turning to digital technologies to improve services, reduce costs, save resources and engage more effectively and actively with citizens. They are becoming 'smarter'.

The smart cities approach makes sense in terms of cost and resource efficiency: it is estimated that worldwide, cities will need to spend around €24 trillion[1] over the next 25 years on modernising and expanding their infrastructure. A large part of this will be smart cities solutions and services, which are expected to occupy a global market of €364 billion by 2020.

Cities need to ensure they are meeting constantly evolving needs and challenges. Becoming a smarter city is a continuous and transformative process, not an end goal. Smart citizens should play a key role in this process, with cities using technology and innovation to engage and empower citizens to develop ideas and solutions. There are new governance and transparency tools available to encourage this co-creation, such as living labs, ways to integrate citizen input into urban planning, and space and support for start-

ups. Successful smart cities will facilitate this participation, co-creation and co-production with citizens and other local partners.

There are plenty of opportunities for cities to learn from each other on this journey. At EUROCITIES, we bring together 130 major European cities to share good practices, expertise and ideas. While we recognise that there can be no one-size-fits-all approach to becoming a smart city, cities can be inspired by the successes and mistakes of others. We are involved in a number of EU-funded projects that are part of the move from paper to action. Our GuiDanCe project coordinates activities through the Green Digital Charter (www.greendigitalcharter.eu), a commitment for cities to become smarter through ICT. It encourages cities to deliver on the EU's smart city and sustainability objectives through urban digital strategies; large scale ICT-based solutions; establishing cities as open innovation platforms; using common standards and facilitating the opening of data; and creating new partnerships under a green and urban digital agenda. It now comprises a community of almost 50 signatories.

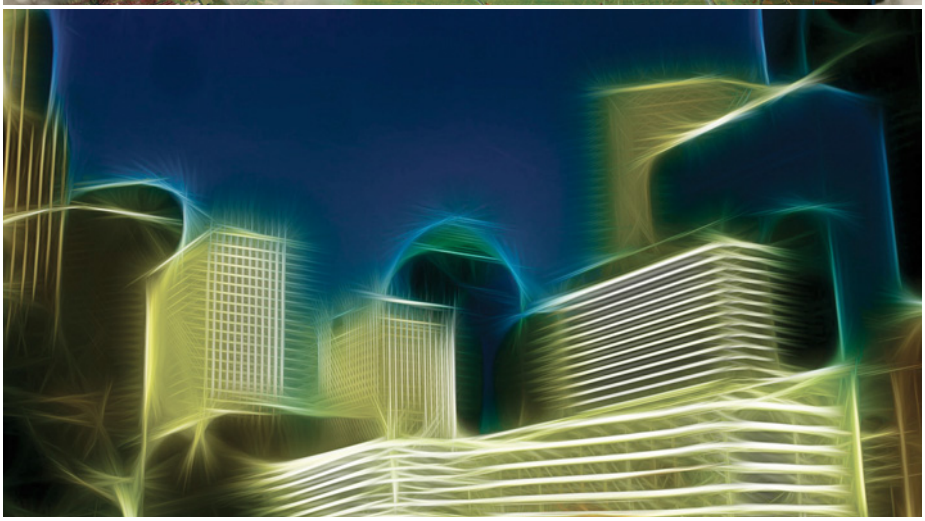
CITYkeys (www.citykeys-project.eu) is a project developing performance indicators and data collection procedures for smart city solutions and projects. It will allow European cities to monitor and compare their progress and strategies, and assess which solutions and projects would work best for them.

In the field of intelligent transport solutions (ITS), OPTICITIES (www.opticities.com) develops and tests interoperable ITS in six of our member cities. Its goal is to provide citizens with the best possible travel options and optimise urban freight logistics.

A further six of our member cities were involved in TRANSFORM (www.urbantransform.eu), which explored the processes and methodologies cities use when developing smart energy plans and projects together with stakeholders. These cities have since signed a memorandum of understanding to continue their collaboration beyond the project.

Some of our cities are already leading the way globally when it comes to becoming smarter. Among these is Amsterdam,

1. Figure taken from http://uk-chinasmartcities.com/wp-content/uploads/2014/11/Smart-Cities-Solutions-Challenge.doc (£17 trillion)



which set up its own smart city initiative in 2009. This now comprises 79 projects being developed in collaboration with citizens, businesses and government. One is 'Buurtbegroting', which allows citizens to better understand the city's finances using open data platforms and infographics. It aims to improve the way city finances and decision making are communicated with citizens.

Barcelona has opened its public spaces for tests and pilot projects on services and products that are in the pre-market stage. It is also creating spaces for citizens to learn new skills and co-create solutions. Eindhoven is doing something similar, opening up the city as an 'urban lab' for products and services that meet the needs of consumers. Its approach builds on the triple helix model of city government, academia and industry working together for local economic development and better quality of life.

Milan is leading discussions on the 'sharing economy', which promises to bring multiple benefits through the sharing of goods and services rather than the constant creation of new ones.

Becoming a smarter city is full of opportunities, but also challenges. The continued opening of new data, for example, begs the question of how personal or citizen-centric data can remain under the control of the individual, and how we can ensure that it remains publicly accessible, non-proprietary and transparent.

The first wave of smart start-ups and mobile applications brought with it questions about new business models that can ensure the sustainability of these projects, and also the need for open interfaces and platforms to ensure interoperability between applications, cities and user groups.

Access to high speed broadband is a pre-requisite for many smart city solutions. This requires research and investment into broadband infrastructure in cities. And with an increasingly digitalised public sector, new risks of cyberattacks emerge. When city systems such as transport, healthcare and electricity are controlled by technology, the effects can be disastrous. Cities need structured responses and specific technology to keep on top of the threat.

There will be ups and downs along the way, but becoming 'smarter cities' is a chance to rise to the challenges of rapid urbanisation. It is essential that cities and citizens are at the heart of this process so that smart city solutions meet the real needs on the ground.

Connecting Smart City Objects

When many devices are deployed in the "Internet of Things" (IoT) network underpinning Smart City applications, data must be gathered and managed in an efficient way. Only a standard communication platform can enable the "many billions" of smart objects in a future Smart Cities scenario and any sort of low power, wide coverage M2M communication will be a core technology for the proper functioning of Smart Cities. But what will be the dominant access technologies?

The ALMANAC Project (Reliable Smart Secure Internet Of Things For Smart Cities) will seek to contribute with solutions to this challenge. At a recent ALMANAC workshop, telecommunication operators and regulators discussed the future access technologies for Smart City energy applications.

Workshop participants pointed out that today's cellular technologies have wide coverage but generally require too much power. Cellular IoT technologies are promising but are currently being standardised. 5G networks will feature a wide selection of Radio Access Technologies (RAT), probably also covering IoT needs but this will not happen until 2020. The ITU World Radio Conference 2015 may set the stage for M2M terrestrial services low energy access layers in the 700 MHz spectrum. Moreover, a large number of Low Power Wide Area (LPWA) Networks are emerging but it is difficult to see what will be the dominant technology and many of them are provided by proprietary networks.

The ALMANAC project has developed a "lightweight" implementation of the ETSI M2M standard platform integrated with higher functional layers such as semantic discovery and delivery capabilities. The ALMANAC solution provides Smart City developers with added value enablers that deliver applications across a variety of "Capillary Networks", connecting distributed objects in the Smart City. The Capillary Networks use the 169MHz unlicensed spectrum with wireless MBus protocol. It is extremely energy efficient with only 70-80 mW/day @1kB data transmission at the device level. Since it is backed by ETSI, it is widely applicable and can be used by existing telecom operators. ALMANAC partner Telecom Italia is now planning to roll out capillary networks in four Italian cities: in Genoa for gas and water in urban areas; in Parma for gas, water and electricity in rural areas; in Reggio Emilia and Scandiano for gas, water, public lighting and tele-heating, both in urban and rural areas.

The integration of capillary networks with Telcos' access networks is a core feature of the ALMANAC Smart City Platform: a multi-service delivery platform collecting, aggregating and analysing real time data from hetereogeneous resources; supporting security and privacy features and considering interoperability, dependability and scalability for a smart and sustainable environment.

Capillary network concentrator/gateway on a Telecom Italia's asset

The ALMANAC Project started on 1st September 2013 and is foreseen to conclude by 31st August 2016. The project's consortium includes seven organisations from four different countries and is led by the Italian research and innovation center, Istituto Superiore Mario Boella.

The ALMANAC project is co-funded by the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 609081.

For more information, visit www.almanac-project.eu or contact Project Coordinator Dr. Maurizio Spirito: spirito@ismb.it

Covenant of Mayors: The way forward for the EU's flagship climate initiative

By Frédéric Boyer, Head of the Covenant of Mayors Office (pictured)

The EU stands at a crossroads: in order to reach its climate and energy targets, it needs significant efforts from all its stakeholders – especially from cities and their citizens. In the framework of the Covenant of Mayors, cities have already proven that they can live up to this challenge. The recently launched new Covenant of Mayors reinforces the commitment of cities to implement the EU's climate and energy objectives at local level.

In 2008, the European Commission launched the Covenant of Mayors with the goal of endorsing and supporting the actions of local authorities that contribute to reaching the European climate and energy targets. Over 6500 local authorities, representing one third of the EU's population, have already joined the Covenant of Mayors and committed to reducing their CO_2 emissions by 28% by 2020, thereby exceeding the EU's 2020 own 20% target.

PRIME EXAMPLE OF DEMOCRATIC BOTTOM-UP MOVEMENT

The democratic, bottom-up approach driving the Covenant of Mayors makes it an institutional

novelty in the European landscape. A city can only join the initiative through the approval of the municipal council. Moreover, the Covenant of Mayors fosters collaborative local governance like no other movement. After adhering, local authorities develop – in close cooperation with all local stakeholders – a Sustainable Energy Action Plan (SEAP) that sets a CO_2-reduction target and outlines which measures will be taken to achieve it. The SEAP development also drives innovation within the city's governance, as different departments fully work together, often for the first time to tackle the cross-cutting issues of energy and climate.

Covenant of Mayors signatories reduce their CO_2 emissions through a variety of actions, from making buildings more energy efficient and investing in sustainable urban transport to boosting local renewable energy production. They regularly report on the progress and implementation of their SEAP by using shared methodological principles. These reports are verified by the Joint Research Centre – the in-house science department of the Commission – and are then made available on the Covenant of Mayors website in order to ensure transparency.

CITIES OF ALL SIZES ARE ENGAGING

The Covenant of Mayors is an inclusive initiative that enables cities of all sizes to join and contribute. One example is the Italian village of Castelvisconti, which is home to 333 inhabitants and is showing extraordinary dedication to climate action. Despite limited means, Castelvisconti is on track to achieve its ambitious CO_2-emission reduction target of 35% by 2020, thanks to actions such as making the village's public lighting energy efficient or scaling up photovoltaic production. Another exemplary case is the German city of Neumarkt in der Oberpfalz (39084 inhabitants), which even aims to decrease its CO_2 emissions by 52% by 2020. In the framework of its SEAP, the city is pooling a large amount of resources to multiply its local renewable energy production. As its monitoring report shows, Neumarkt in der Oberpfalz is charging full steam ahead on its way to energy independence with its commitment to local renewable energy. These are just a few of the many dedicated cities of the Covenant of Mayors that play a key role in implementing the EU's climate and energy targets.

THE NEW COVENANT OF MAYORS: REINFORCING CITIES' COMMITMENTS

On the 15th of October 2015, signatories endorsed the objectives and framework of the Covenant of Mayors for Climate and Energy. This new Covenant of Mayors strengthens and reinvigorates the contribution of cities to the EU's 2030 climate and energy objectives. In the new Covenant of Mayors, cities commit to reducing their Greenhouse Gas Emissions (GHG) by at least 40% by 2030, by investing in energy efficiency and renewable energy. Cities will also place greater emphasis on providing secure and affordable energy to their citizens, thereby reinforcing social justice. Moreover, cities will adopt an integrated approach to climate change mitigation and adaptation, in order to increase their territories' resilience.

On the 24th of November 2015, the Belgian city of Ghent was the first city to sign the new Covenant of Mayors. Ghent had already signed up to the previous Covenant of Mayors in 2009, and has now proven that it is willing to keep its forefront position in tackling climate change. For Ghent's mayor Daniël Termont, this new commitment to reduce CO_2 emissions by 40% by 2030 "puts the city on track to become carbon neutral by 2050", as he told Cities Today in a recent interview. Ghent will increase its current SEAP budget of EUR 140 million in order to reach the 2030 target, and will also boost its efforts in the areas of housing, mobility, businesses and renewable energy. To fulfill its previous Covenant of Mayors commitment, Ghent implemented several successful actions, such as revitalizing the Lederberg Leeft district or coaching companies on energy management practices, an action for which the city was awarded a Climate Star Award in 2014.

THE COVENANT OF MAYORS GOES GLOBAL

Looking beyond the COP21, the new initiative is also set to broaden its geographical scope and adapt the European success model of the Covenant of Mayors to the rest of the world. Thereby, it will become a global Covenant of Mayors that will transform urban governance, climate action and citizen involvement beyond European borders.

The Scanergy Project a SCAlable and modular system for eNERGY trading between prosumers

Scanergy is an EU FP7 Marie Curie Industry-Academia Partnerships and Pathways (IAPP) project running for 3 years between February 2013 and January 2016. The project is a partnership between Vrije Universiteit Brussel in Belgium and Sensing & Control Systems – an SME in Barcelona, Spain.

Scanergy aims to develop a scalable and modular system for energy trading between producers and consumers of energy in the smart grid. These end users can collectively reduce their carbon footprint, as well as their dependence on fossil-fueled power plants by trading locally-produced renewable energy.

The main contributions of the project are the development of an incentive mechanism for renewable energy trade, called NRG-X-Change, and a novel digital currency for energy, called NRGcoin.

The innovative aspect of NRG-X-Change is that it allows prosumers to generate their own revenue when feeding energy in the grid. This mechanism was shown to improve over the net metering subsidy policy applied in some countries and offers additional advantages for all actors in the grid. Similar to Bitcoin, NRGcoin is a digital currency with no central issuer – it is governed by a cryptographic peer-to-peer decentralized protocol. On a global level, NRGcoin allows direct investments in the energy sector and has the potential in the long run to boost the renewable energy economy. These concepts have sparked the interest of a large player on the hydro-power market, who has contacted the team to negotiate further developments.

Additional concepts developed in this project include a novel demand response mechanism and a battery control strategy both using advanced machine learning techniques. The team showed how the combination of these concepts allows to decrease the overall stress on the grid, saving on infrastructure costs, and to reduce the demand for energy from non-environmentally friendly sources.

The Scanergy system incentivizes consumers to use the cheap renewable energy when it is available and rewards prosumers for injecting energy when it

is needed, reducing the need to fire up emergency peak power generators, which are both costly and pollutant. The novel concepts developed in the Scanergy project have been compared against state-of-the-art mechanisms in Repast Simphony simulator using real data and they are shown to provide sufficient economic benefits while motivating the consumption of renewable energy.

To demonstrate the applicability of Scanergy in the smart grid, the team deployed these concepts in a model replica of a typical Belgian neighborhood featuring mini solar panels and Raspberry Pi for smart meters. This interactive demonstration won the Best Demo Award[1] at the International Conference on Autonomous Agents and Multiagent Systems (or AAMAS) in Istanbul in May 2015. The Scanergy project was also featured in a popular science article in Intel's iQ Magazine[2].

The team is now working on scaling up the deployment to real houses and demonstrating the replicability of the concepts in real-life scenarios. Additional project proposals are being currently developed that build on the success of Scanergy.

More information on the Scanergy Project you can find at www.scanergy-project.eu.

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Technical Coordinator: Narcis Avellana, Sensing & Control

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A smart city is a district energy city

By Dana Popp, External Relations and Communications Manager, Euroheat & Power (pictured)

Cities represent more than 70 percent of global energy demand and account for half of greenhouse gas emissions worldwide. The only way forward is a smart integrated approach built on the synergies of the most important sectors involved (electricity production, heating and cooling, transport) and aimed at substantially increasing energy efficiency and at the same time supplying sustainable energy. A smart city approach must take into account the whole energy transformation chain (demand, supply, distribution, storage) and the interactions with urban planning, mobility, water, waste, socio-economic conditions and quality of life.

The construction and expansion of smart district energy networks (combining district heating and district cooling, integrating and balancing a large share of variable renewable power, serving as thermal storage) is a key prerequisite for the large scale utilisation of low-carbon and renewable energy at the heart of the city. Such networks must therefore play an important part in the urban energy system and act as key smart city component.

Smart thermal grids can ensure a reliable and affordable heating and cooling supply to various customers of low carbon and renewable energy using waste heat (particularly from industry), waste-to-energy, solar thermal, biomass and geothermal energy. To make this possible in a smart city context, district energy networks are flexible in different energy demand and supply situations, quickly adapt temperature levels to decreasing heat demand as well as align to overall urban planning.

Today's innovative thermal networks are intelligently planned and operated, counting on (smart) metering and control. Their integration with the whole urban energy system (in terms of urban planning but also the interaction with other urban networks such as electricity, sewage, waste, ICT) plays a key role. Moreover, smart district energy networks are designed to achieve the highest overall efficiency by choosing the optimal combination of technologies and enabling the exploitation of available local energy resources.

The crucial place for district energy networks in smart cities has already been acknowledged at European and international level. A large number of EU funded projects deal with the subject from different perspectives. To name but a few:

Celsius Smart City (celsiuscity.eu) takes a holistic approach to overcome technical, social, financial and political barriers to district heating and cooling solutions. It demonstrates and promotes the capture and utilisation of waste heat that is generated within cities every day and that is otherwise lost to the atmosphere. One of the aims of Step Up (www.stepupsmartcities.eu) is to create a model for energy planning that will deliver faster and greater impact, contributing to meeting Europe's 2020 energy and climate change targets, with district heating being one of the main energy planning pillars. SmartReFlex (www.smartreflex.eu) project aims at increasing the diffusion of smart and flexible district heating and cooling systems, with high shares of renewable energy sources, in European cities. GrowSmarter (www.grow-smarter.eu) brings together cities and industry to integrate and demonstrate '12 smart city solutions' in energy, infrastructure and transport, to provide other cities with valuable insights on how they work in practice and opportunities for replication – coming as no surprise, one of the key solutions of integrated infrastructures covered by the project is district heating, based on waste heat recovery. SINFONIA (www.sinfonia-smartcities.eu) aims to deploy large-scale, integrated and scalable energy solutions in mid-sized European cities – this will be done through an integrated set of measures combining buildings retrofitting, optimisation of the electricity grid, and solutions for district heating and cooling.

At international level, 2015 saw the launch of the UN Environment

Programme's "District Energy in Cities" report, an initiative under the "Sustainable Energy for All" Global Energy Efficiency Accelerator Platform, actively promoted by Euroheat & Power. When surveying low-carbon cities worldwide to identify the key factors underlying their success in scaling up energy efficiency and renewable energy, district energy systems emerged as a best practice approach for providing a local, affordable and sustainable energy supply, improve energy efficiency and support energy access efforts. The report provides concrete policy, finance and technology best practice recommendations on addressing heating and cooling in cities through energy efficiency improvements and integration of renewable energy sources.

Euroheat & Power and its members also work together with various European and international organisations promoting smart and resilient cities, such as EnergyCities (European Association of local authorities in energy transition) or ICLEI (Local Governments for Sustainability, a network of over 1,000 cities, towns and metropolises committed to building a sustainable future), which recognise and promote district energy.

Smart cities are those cities taking a holistic approach to their energy management. The key word is integration. Integration of energy infrastructures and city planning. Integration of processes, concepts and technologies. Integration of all aspects of energy demand and supply. Whenever we speak about integration and connecting all pieces of the sustainable energy puzzle, we speak about district energy. A smart city is a district energy city.

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Supporting energy use optimisation in public

It is known that buildings are responsible for 40% of the European Union's (EU) energy consumption and 36% of its CO_2 emissions. What is perhaps less known is that by simply monitoring energy use in buildings at least 10% can be saved, without changing the existing infrastructure. And further savings can be made through improved energy data management and real-time monitoring systems. The FP7 project OPTIMUS builds on this basis by working together with three local authorities to develop an innovative, free and easy-to-use Decision Support System (DSS) to optimise energy use in our public buildings.

As permanent bodies that plan for the long term, towns and cities are uniquely placed in helping to achieve the EU Climate & Energy objectives and the transition to more sustainable urban environments. The Covenant of Mayors (CoM) initiative illustrates impressively the potential and commitment towards ambitious, local climate action and achieving the EU 2020 targets on reducing greenhouse gas emissions and increasing energy efficiency.

As such, three cities and CoM Signatories: Savona, Sant Cugat and Zaanstad have been working closely together with a team of researchers, to develop the OPTIMUS DSS to enable municipal energy managers identify the best ways to improve energy use in the buildings they monitor and manage. The OPTIMUS DSS is able to produce action plans for building managers to implement by capturing and analysing data that range from weather monitoring, building sensors, and energy prices, to local renewable energy production and occupant feedback regarding thermal comfort.

Prof. Haris Doukas (left) from the National Technical University of Athens (OPTIMUS Coordinator) says "Managing a city's ecosystem of data offers huge potential to better assess the energy savings in buildings. By combining real-time data in an integrated way, the OPTIMUS DSS will enable local authorities to produce short-term energy plans and implement an overall more responsive, smarter, sustainable action plan for energy use, for their buildings and venues.

We aim to support local authorities in reducing building energy consumption and carbon emissions, save money and make sure that we have the right technology in place to achieve the best possible results."

The three cities will be piloting the OPTIMUS DSS from December 2015 until September 2016.

1) SAVONA
Pilot building: Colombo Pertini junior high school
- Construction year: 1957
- Floor space: roughly 6.092 m^2
- Energy consumption: 59.222 kWh/year/53.118 cbm/year

2) ZAANSTAD
Pilot buildings: Zaanstad town hall and theatre
- Construction year: 2011
- Floor space: roughly 18.531 m^2
- Energy consumption: 221 kWh/m^2 per year

3) SANT CUGAT
Pilot buildings: Sant Cugat town hall and theatre
- Construction year: 2007
- Floor space: roughly 8500 m^2
- Energy consumption: 126 kWh/m^2 per year

1

2

buildings: the OPTIMUS DSS tool

Free training sessions available from 2016
The OPTIMUS project is offering this tool online and free of charge, together with tailor-made training courses on how to use it which are scheduled to take place during spring 2016. The OPTIMUS DSS will be launched, and the timetable for these training sessions will be shared, at the European Conference on Sustainable Cities & Towns in April 2016 www.basquecountry2016.eu

To find out more about the city profiles and how they are implementing the OPTIMUS DSS, you can follow the journey online by visiting: www.optimus-smartcity.eu

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Buildings and the energy market: a challenging

By Maarten de Groote and Francesca A. Fata, Buildings Performance Institute Europe (BPIE)

Today's energy market is not defined and constricted by boarders or national systems anymore, it is developing into a less centralised, more and more interconnected and variable system. It is also being pushed to its limits by the significant penetration of decentralised and mostly inflexible renewable-energy-generation technologies, as well as by the increasing degree of electrification. A quarter of Europe's power currently comes from renewables, a proportion which may even double by 2030. As a consequence of all these factors, the energy market has to face huge demand-supply challenges, and the appearance of flexible solutions such as demand response – the ability to modify electricity usage by end-use customers during system imbalances or in response to market prices – is still too shy.

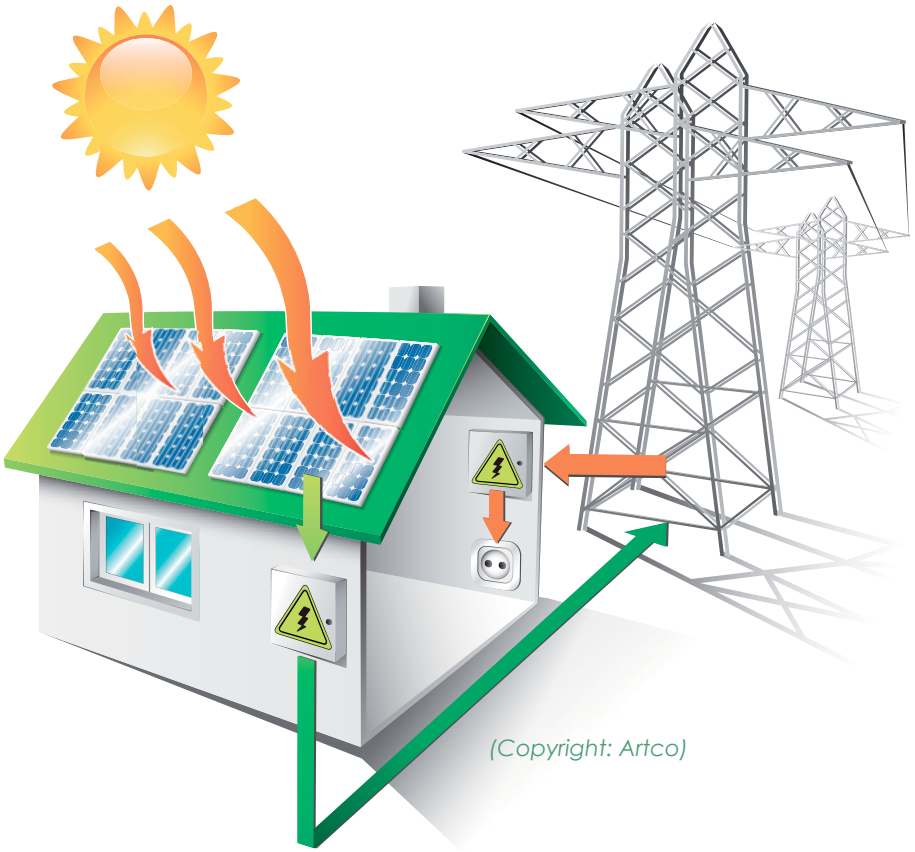
Concerning these recent developments, experts are starting to ask themselves how energy provision can be ensured in the long run, and, what is more, what happens with the energy surplus generated every day. A sustainable answer to these and related questions lies in paving the way for buildings to take on an important role in balancing the energy market. As the largest energy-demand-side actor, they could play a key part in tackling the energy market's challenges, but this aspect has not yet been explored sufficiently.

THE ACTIVE ROLE OF BUILDINGS

In an energy system as complex as today's, energy efficiency and innovative technologies, such as demand response, storage and advanced renewable installations, are crucial for accelerating the transformation of our homes from simple energy consumers into much more active players. This facet will become even more intriguing than implied by the fashionable word 'prosumer' (producer + consumer) referring to it. (Popov, 2015)

As the biggest energy-demand-side actors, buildings could be the key to tackling the energy market's challenges and, at the same time, unlock the potential for innovation and great value to be captured. However, this topic has not yet been explored sufficiently. A recent discussion paper by BPIE[1] digs into this subject by describing the position of the buildings sector, presenting strategies and enabling measures to speed up the interaction between the energy and the buildings sectors.

A successful synergy between buildings and the energy market would allow for fast adaptation to operating loads, increased penetration of building-integrated PV as well as other renewable-energy systems, and it would facilitate balancing and decreasing the load on the grid. Energy efficiency and interaction of buildings with the energy market are crucial to meet future energy needs with the lowest supply and transmission capacity and costs. This transformation would be beneficial to all kinds of consumers, including households facing increasing energy bills, commercial businesses and industrial players having to compete with companies from countries with lower energy costs.



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but rewarding interaction

NEW TECHNOLOGIES FOR A FUTURE POWERED BY BUILDINGS

Thanks to the benefits of experience and scale, the tipping point for the combination of photovoltaic energy systems and power storage in buildings is expected to be reached in a few years. In addition to that, demand-response applications are also suitable for buildings without renewable energy production, since their consumption during peak hours (when electricity is scarce) is mostly higher. While demand response and power storage systems can easily be integrated in existing buildings, they have not reached full market maturity yet. So, to be commercially competitive, these technologies require strong marketing innovation.

All this could significantly impact the building value chain, as it creates a need for tailored services to manage demand in an efficient and responsive manner, and integrate self-production and storage. The uptake of demand response and power storage is closely linked to the inclusion of related technologies, such as energy management systems, smart meters, smart thermostats, heat pumps and electric vehicles. Further, the integration of electric vehicles in the energy cycle of buildings is likewise advantageous for the energy use of buildings as well as the energy flexibility in the grid.

Since the interaction of buildings and respective smart devices with the energy market is beginning to increase, if the "big four" building control companies are not to cover the demand response segment for the residential market in the near future, other actors surely will. New market actors, who are already jumping on the bandwagon to enter the market, originate from the ICT (e.g. Google, Apple), the utility (e.g. E.on, British Gas) and the electric vehicle (e.g. Tesla) value chain. Likewise, there is an opportunity for manufacturers of household appliances and products such as heat pumps, HVAC and white goods to adapt their products to the needs of this new technological environment.

Surely enough, behavioural changes do happen faster with growing societal acceptance. Widespread adaptation of renewable and storage technologies, as well as marketing campaigns, such as the Powerwall campaign by Tesla for instance, strongly contribute to this development. When it comes to new technologies however, concerns regarding comfort and data privacy need to form an integral part of the innovation process.

ROOM FOR IMPROVEMENT IN EU BUILDINGS LEGISLATION

The existing EU buildings legislation already addresses some challenges to speed up the interconnection between the energy sector and the buildings sector, but to ensure consumers have the opportunity to better participate in the market, a stronger policy focus on the issue is needed. As acknowledged by the European Commission in its Energy Union Factsheet,

(Copyright: Pecold)

innovation for energy storage and flexibility in demand response are highly desirable solutions.

While technological innovation will continue to support the transformation and integration of the energy and buildings sector, policy innovation is needed most urgently now. The ongoing reviews of related European directives provide important opportunities to create an enabling and transformative regulatory environment. This will result in lower investment costs in the energy system, a lower CO_2 intensity of the energy supply, and a more stable and flexible infrastructure.

1 "The active role of buildings in a transforming energy market", BPIE, 2015. www.bpie.eu

The 'Digital DSO' and the smart grid

By Ana Aguado, Secretary General, EDSO for Smart Grids (pictured)

As highlighted by the European Commission's "Digital Single Market Strategy," in recent years digital technology has been changing not just our economy but also our daily lives. And this digital technological change is expected to continue for some time to come.

A number of interdependent digital trends are prompting electricity distribution system operators (DSOs) to refocus their business and strategy on digitalisation and to deploy 'smart grids.' Some of these trends include:

Connectivity: Every asset, every device, every person is now connected and inter-connected via wireless (and sometimes wireline) communications.

Collaboration: This connectivity allows for multiple forms of collaboration to increase efficiency and improve performance. Such collaboration includes consumer to network operator via smart meters and machine-to-machine (M2M) smart appliances in consumer premises – among others.

Personal data innovation (while respecting privacy): data management innovations are emerging even while complying with the current and future data protection legal framework.

Big data: With the deployment of intelligent sensors, smart meters and smart appliances and devices (i.e., the 'Internet of Things'), the volume of data is increasing exponentially. New forms of collecting, storing and processing data will result in improved operations and enable new business opportunities.

Open data: initiatives for all government and other public data to be published and made openly re-usable will lead to the development of innovative applications and services. For DSOs, an open data approach could be pursued in the context of smart meter data.

Cybersecurity: Connected, collaborative energy networks and systems and the use of cloud computing are potential target for cyber attacks. Securing such smart grids has to be a top priority.

EMERGING VISION OF A DIGITAL DSO

Traditionally, DSOs operated as asset-centric companies, physically managing electricity distribution infrastructure assets, such as electrical lines and cables, substations and transformers. With the upgrading of these distribution networks into 'smart grids,' however, the asset base is being expanded to include equipment such as M2M monitors and sensors and smart meters. This also is leading to DSOs becoming data-centric companies, using digital technologies to optimise asset management, and improve network operation and increase customer service.

An emerging vision of a 'Digital DSO,' to which EDSO for Smart Grid members are aspiring, is of an upgraded network and systems with:

Digitalisation in network management

- robust cybersecurity;
- ability to predict and handle power infeed with bi-directional power flow to manage Intermittent and decentralised power production;
- evaluation of energy data to predict grid loads and anticipate bottlenecks. This allows for the optimisation of network investments;
- real-time processing of load data, enabling the integration with demand/supply balancing service to optimise grid utilisation;
- new capabilities in predictive maintenance and self-healing concepts help to further reduce operational costs;

- predictive analytics based on sensor data, enabling smarter asset management with a fully digital allocation of spare parts, work, and logistics;
- long-term system planning and integration with other (regional) grids;
- data-enabling asset maintenance, management and replacement;
- storage management, enabling efficient load balancing, shifting of demand and improved supply reliability;
- hardware-in-the-loop testing, including complex simulation and hardware testing;

Digitalisation in network operations

- data-enabled forecasting for renewables, loads and flexibility;
- fast transactions allowing close-to-real-time intra-day market closure for better integration of variable renewables in the wholesale market;
- digital support for grid operations, allowing very fast response, and/or allowing very thorough analysis of contingencies and their consequences;
- digital support for field technicians, allowing access to information, procedures, reporting back, etc.;
- digital business processes, replacing manual transactions in procurement, inventory management, invoicing, and payment processing;

Digitalisation in distributed resources

- meter-point operations to digitally connect to the consumer and enable value-adding services;
- collaboration with prosumer, consumers who produce their own energy, to reduce consumption and optimise network management;
- data-enabled transactions among DSOs, aggregators supplier, aggregator and consumers;
- standardised and secure data exchange to support market communications (e.g., supplier switching, meter data exchange, billing data exchange, nominations);
- provision of anonymised and/or aggregated data to public administrations and market parties – as mandated by regulation or motivated by market facilitation.

REGULATORY ENVIRONMENT ENABLING DIGITAL DSOS

The current EU and national regulation which rule a DSO's business, however, do not always give the right incentives and provide the necessary predictability for network operators and other potential investors for smart grids. EDSO for Smart Grids thus will be active in influencing the policy agenda in 2016 and beyond. Some of our policy proposals include:

Digital Single Market

Any reform of the "Telecoms Regulatory Framework" should maintain the 'virtuous circle' of regulatory-enabled competition in traditional and next-generation networks.

Adopting EU-level, pro-competitive spectrum policies will result in the rationalisation and modernisation of spectrum management and help reduce spectrum scarcity.

Responsible for security of supply in their area of service, DSOs need a reliable communications system to control their network. For that purpose, access to dedicated bandwidth at cost-oriented prices is needed.

There should be the timely adoption and implementation of data protection regulation. Non-personal data and anonymised and/or aggregated personal data should not be subject to any restrictions regarding its management.

Digitally-oriented revisions to Third Energy Package

DSOs should be consulted if the European Commission intends to revise the minimal functional requirements for smart meters or to mandate their functionality.

As DSOs are already regulated and neutral parties, they should remain responsible for collecting, storing and managing consumer data to ensure a secure, efficient and transparent framework for data exchange for market parties.

DSO should be allowed to establish shared data exchange infrastructures for storing and exploiting smart metering data, without the appointment of a third-party manager.

CONCLUSION

Leading DSOs are preparing to exploit the digital technologies and data solutions associated with these trends to improve their business performance and customer service. In doing so, they will become active players the EU's Digital Single Market.

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Ecotur Funditec

The technological efficiency is a fundamental instrument to respond to the four main challenges of the global energetic field: the climate change, the supply's quality and security, the markets' evolution and the responsibility of the source of energy. The set of activities being understood by energy efficiency directed to reducing the energy consumption in unitary terms, improving the utilization of the same one, in order to protect the environment, to reinforce the supply's safety to create a sustainable energy policy.

The tourism sector will represent around 11, 2% of the gross domestic product in Spain by the end of 2015 according to Eurostat. In comparison with the main OCDE countries, the production and the employment have a major dependence to the tourism sector in Spain in regard to other countries. Besides other factors like being a tax-free and stable sector for our economy, which has supported the occupation and the average daily rate, it is relevant to a strategic level promoting the improvement of its competitiveness, which must innovate to be supported as an attractive point for the worldwide tourist demand. The impact of a restructuring and the improvement of the competitiveness in this sector would suppose a direct investment of 364 million Euros of agreement with IDAE - Institute for the Diversification and Saving of the Energy.

The energetic distribution in the hotel sector is complex, being difficult to establish a standard distribution for the variety of percentages of energy consumption. Generally electric power is consumed essentially for consumption in machinery, illumination system, water pumping, ventilation, etc. The degree of ideal efficiency is obtained when the consumption and the comfort are adapted in proportion. By means of a "simple" energetic annual accounting and extraction of a few ratios of consumption, they can take decisions for the reduction of the consumption and of the cost of the energy. The potential of energy saving in the hotel sector is key for the economy and the employment, and therefore, this sector is more competitive in Spain.

FUNDITEC "www.funditec.es" is a non-profit foundation located in Barcelona with the mission to contribute to the economic and social development through the promotion of technology and innovation. Funditec counts on the sustainability, and in this regard, in order to put jointly ideas, offers and experiences that help and stimulate the hotels to continue with actions and measures to increase the energy efficiency, the ECOTOUR project "Management of the Energy efficiency in the Industry of the Tourism " www.ecotourproject.com, was born. It is a project of permanent learning financed by the CE in the frame of the program Leonardo da Vinci. This project is coordinated from Romania even though other countries such as Spain, Italy, Netherlands, Finland and Austria participate.

The main aim of the project is the knowledge, skills and competences transfer of the Energy efficiency Manager to the Tourism Sector. A free e-learning platform has been created "www.ecotourplatform.com", highly qualified with different modules of training as the ecolabel of the EU, the water management, the lighting, the refrigeration, the control of the energetic consumption, etc. On December 3, 2015, the final project conference took place in FUNDECYT, with the participation of hotel directors, energy efficiency managers, ECVET representatives, tourism associations, and relevant stakeholders.

If you are interested in the Foundation, in the project or in the final event, you can send a mail at: gpadilla@funditec.es.
Agenda of the event: http://bit.ly/214UATM

Construction's small businesses can contribute to fighting climate change

By Patrick Liébus, President of EBC – Construction SMEs Europe (pictured)

Buildings are the places where people spend most of their life, where they work, learn and have fun. This is partially the reason why these buildings are responsible for 41% of final energy consumption and 36% of all greenhouse gas emissions in the European Union. It is by far the single sector with the highest figures in this respect.

The good news is that a lot of this consumption can be saved quite easily and in a cost-optimal way! This means that if policy makers want to address climate change they will need to look better into energy-efficient renovation of buildings.

About 35% of European buildings was created more than 50 years ago and 2/3 of the existing buildings will still be used in 2050. It goes even further when we consider the building types. Indeed, 75% of the square meters of the EU existing building stock is made of housing, with industrial and commercial buildings only making up 25%.

This makes it evident that micro, small and medium companies usually closer to private real-estate owners will therefore be the key actors of the ambitious European climate policies by carrying out most of the works in the energy renovation market. The construction sector is indeed composed by micro-companies: 92% of all the building enterprises in Europe have less than 10 employees. These firms create local and qualified jobs. So they are a real resource for the communities and must be taken into account by European and national policy makers.

IMPROVING THE IMPACT OF EUROPEAN LEGISLATION

The main two pieces of legislation adopted by the European Union – the Energy performance of Buildings Directive (EPBD) and the Energy Efficiency Directive (EED) – have already brought out some improvements.

On one hand the EPBD – adopted in 2010 – introduced the obligation to inform households about the energy performance of buildings and of the minimum energy requirements through a system of energy performance certificates. On the other hand, the EED – adopted in 2012 – introduced the possibility to create partnerships between the energy services providers and the so-called 'obligated parties' (energy distributors and retail energy sales companies).

However, there are also gaps in the legislative framework. On the whole, there is a lack of coordination in European legislation concerning energy and environmental issues. The European institutions should avoid repetitions and better coordinate their initiatives.

Construction SMEs need a clear and long-term regulatory framework that can facilitate investments.

The European Commission should also monitor Member States' implementation of EU

rules to avoid gold plating at national level and at the same time, ensure ambitious policies to be given the proper attention and resources they need. For example, the energy performance certificates are not used or not properly used in every country and the energy efficiency strategies are lagging behind in implementation. We need to do more on both counts!

FINANCING IS ONE OF THE MAIN ISSUES

One of the main problems to improve energy efficiency in buildings is financing. Residential buildings represent around 75% of the entire building stock. Therefore, it is the main market for energy renovation. However, energy efficiency works are expensive and very often owners cannot afford them for the lack of upfront money.

Funding measures should be simplified and one-stop-shops where owners can get the information they need about the available fiscal and financial incentives should be created. It is also fundamental that the incentive schemes are not changed very often, because owners are being discouraged from investing by changing conditions.

Another key measure is a reduced VAT rate for renovation works. Although it has proven its effectiveness, regrettably many Member States did not taken this provision into account among the instruments to increase energy efficiency.

In June 2015 the European Union adopted the European Fund for Strategic Investments (EFSI) with a view to mobilising € 315 billion for strategic investments and stimulate growth of the European economy.

The Plan is intended to target SMEs in particular. However, under the proposed structure, the projects to be financed under the EFSI could be too big for SMEs. Therefore, they could face difficulties in submitting projects or participating in them. The Plan should finance small-scale projects to give small companies a concrete chance of being involved. Moreover, EBC advocates that priority should be given to projects aiming at saving energy in housing.

UPSKILLING THE WORKFORCE

Another measure that would help construction SMEs in delivering more renovation works include the training of the workforce. The Build Up Skills initiative introduced at European level is a step in the right direction. Build Up Skills aims at improving the qualification levels of professionals in the building sector on energy efficiency and renewables. After establishing a roadmap , Member States must now put in place a system to address the lack of skilled labour through a new qualification and training system.

Finally, citizens should be informed through awareness raising and information campaigns about changing behaviours, financing, regulations and specific needs of the environment where they live. As a local actor, small entrepreneurs are the best placed to advise customers on the works.

Only taking into account the needs of the owners and facilitating the financial, economic and regulatory conditions for construction SMEs, will the European Governments improve the energy performance of the building stock and ultimately tackle climate change.

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kamstrup

You cannot optimise what you do not measure

High energy efficiency is dependent on transparency in the distribution network as well as in consumer behaviour and in the energy performance of buildings. This makes frequent and accurate metering data part of the solution for managing and optimising energy production in an integrated and truly smart energy system.

In the future, energy consumption must adapt to the fluctuating production based on renewables, and this will require fully integrated energy systems that can bring it into balance. As renewable energy resources are more expensive to produce than traditional energy production, it is increasingly important to ensure that they are exploited as efficiently as possible. This calls for focus not only on improving energy efficiency, but also on reducing our collective energy demand.

ENERGY EFFICIENCY REQUIRES TRANSPARENCY

High energy efficiency necessitates running production as close to the limit as possible. This makes it even more crucial for utilities to continuously manage and optimise their production decisions and distribution network. It also demands increased involvement of the consumers and putting into play the energy performance of buildings. All three conditions necessitate transparency – in the distribution network as well as in consumer behaviour and in building characteristics – and the basis for that transparency is frequent and accurate meter readings.

METER DATA PROVIDES KNOWLEDGE

The use of data offers a range of opportunities. Hourly values on flow, temperature, pressure and consumption not only enable utilities to detect and reduce waste in the distribution system. It allows them to identify and help consumers with inappropriate energy consumption. Furthermore, giving consumers instant access to information on their household consumption encourages proactivity and energy conscious behaviour.

Increased amounts of data also opens up to the possibility of introducing alternative tariff models that are, for instance, based on flexibility rather than consumption, or on hourly variations of prices resulting from the balance in the total energy system. And precise data – as opposed to theoretical models – on how a building performs under different conditions, allows utilities to directly target the buildings that pose the biggest challenge in the network. This helps establish the needed correlation between buildings and the production part of the integrated energy system.

In this way, the knowledge derived from meter data gives the necessary flexibility to constantly balance the total energy system and ensure that energy is always produced optimally based on the present conditions.

"Meter data becomes really valuable when utilities use them as the basis for making decisions that optimise their business and day-to-day operations. Our intelligent metering solutions deliver the necessary data and makes it easy for utilities to translate it into knowledge that supports increased efficiency in the integrated energy system," says Steen Schelle, Head of Product Management, Kamstrup.

Steen Schelle, Head of Product Management, Kamstrup

INSPIRED BY BETTER

A world-leading supplier of intelligent energy and water metering solutions, Kamstrup provides utilities and energy companies with tools that enable them to make more certain, smarter business decisions and inspire the communities they serve.

Learn more at kamstrup.com

Making Energy Efficient Buildings a Reality: the 3 Point Plan

By Shradha Abt, Energy Efficiency Manager, Eurima

European Energy Innovation is happening before us. As Europe modernises infrastructures, shifts away from a fossil fuel based and dependant society to a decarbonised, decentralised and flexible energy system – it is going to change the way we produce, transport and consume energy.

As the EU sets out to realise the five dimensions of its European Energy Union Strategy; secure energy supply, an integrated internal energy market, energy efficiency, decarbonisation, and research and innovation – highly efficient buildings not only tick all the above boxes but also bring the most multiple benefits (jobs, health, social, GDP etc.) to consumers, business and government alike.

Buildings are responsible for the largest share of European final energy consumption (40%) and CO_2 emissions (36%) and they represent the greatest potential to save energy, reduce our energy dependence, shrink our carbon footprint, tackle fuel poverty, and lower our household energy bills. Keeping in mind that the energy transition will require massive investment in supply network and infrastructure, highly efficient buildings can precisely reduce this infrastructure investment and bring supply side flexibility through a reduction of the overall base load and the system peak[1].

As our energy system faces a transition, EU buildings legislation must follow the principle of 'trias energetica'[2], this means ensuring a low energy demand in buildings, particularly for heating and cooling needs. Doing so will ensure resilience in the energy system, enable the right equipment sizing, and create the best start for integrating renewables and connectivity (e.g. demand response).

Whether it's constructing new buildings or renovating existing buildings, we need to make sure that our buildings are resilient in long run. This is where the building envelope plays an essential role, as it provides a structural solution and ensures the overall efficiency of a building over its entire lifespan.

In this respect, mineral wool insulation is a unique, reliable, cost-effective and highly versatile product. Its thermal properties contribute hugely to European efforts to save energy and combat climate change. Additionally, the structure of mineral wool prevents the movement of air– coupled with its long-term stability, gives the building a unique ability to combat noise pollution and improve fire protection. As Europe seeks to upgrade the sustainability of its building stock, mineral wool insulation is key to the creation of low energy buildings.

So then how can we speed up the rate and quality renovation of our existing and inefficient building stock (75%) and reduce the enormous energy wasted in buildings for heating and cooling?

The answer is embracing this energy change by placing an economic and societal value on the array of energy efficiency benefits and giving precedence to building envelope measures.

The below three point policy plan illustrates how we can ramp up renovation and get back on track to making highly efficient buildings a reality.

1. **Vision: Renovating the existing EU building stock to NZEB level by 2050.**
   The Energy Performance in Buildings Directive recast (EPBD) created an important market pull for sustainable construction products by setting a long term objective for our buildings to be 'nearly energy zero' by 2020. We now need a similar EU framework, supported by clear national targets and milestones, for the existing building stock to be NZEB by 2050.

2. **Objective: Reducing energy demand for heating and cooling.** Measures to improve buildings should focus on the root of the problem, the 70% energy used for heating (and cooling). A 'ceiling' benchmark for heating & cooling (H&C) energy demand will trigger the needed energy renovations, prevent the lock-in of voluminous portions of savings and avoid having oversized heating and cooling distribution system ending up as stranded assets.

3. **Action: renovation.**

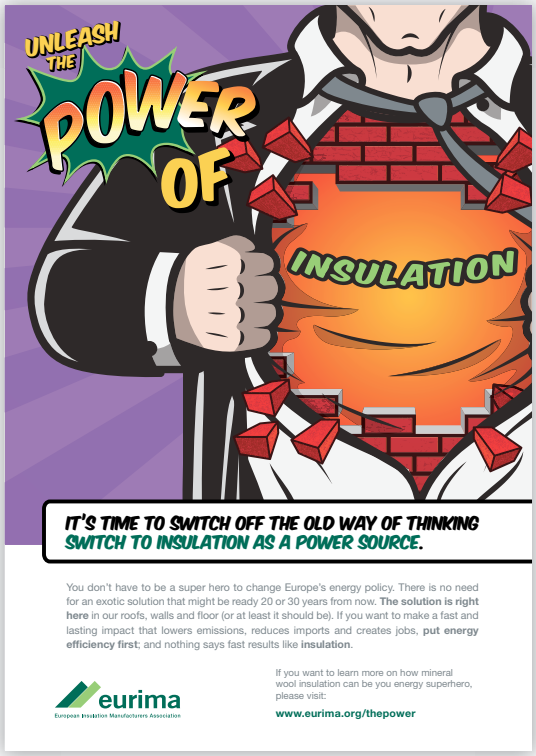
- **Creating demand** and self-acceleration towards renovation means information, visibility and knowledge for stakeholders including building owners, and a more tangible business case for renovation. This also includes linking renovation to key 'trigger points' (change of tenant, extension of building, renting a property).

- **Energy Performance Certificates** (EPC) should be developed into a building passport, which follows the building throughout its life and contains tailor-made renovation recommendations. Such a passport would include steps to undertake to achieve a targeted level of performance. This oversight can also help consumers with awareness about the gains and paybacks of energy renovations and enable them implement the recommendations.

- **Financing** is essential to spurring renovation, but it can only be done if building owners can easily, cheaply and for the long haul tap into financing. A 'one stop shop' at local level with technical expertise (about available subsidies, policies, and accredited professionals) is another key ingredient to unlocking the renovation challenge.

We now need to prioritise energy efficiency in buildings as part of broader structural reforms to improve the EU and national competitiveness of the economy and make it a fundamental part of our climate & energy strategies.

The energy, climate, economic, societal and health benefits are too many and too large to go unnoticed anymore…it's time to unleash the power of mineral wool insulation…



1. Ecofys 2015 energy efficient buildings and the future power system
2. The Trias Energetica makes clear that energy savings have to come first on the path to environmental protection. Only when a building has been designed to minimise the energy loss, should the focus shift to renewable energy solutions, such as solar panels or heat exchange and recovery systems.

Green HP: Towards a decarbonized energy system with heat pumps
How to reduce CO_2 emissions in cities

The building sector is one of the main consumers of energy in Europe. This fact has prompted the EU-funded development of a heating system for use in urban areas that can interact with future smart energy infrastructures.

Carbon dioxide (CO2) levels emitted from European cities must be dramatically reduced to meet current EU 2030 goals or targets outlined in several EU directives. One key solution for turning our high-populated cities to sustainable living areas, is by renovating and retrofitting buildings with low emission heating systems.

Heat-pump technologies can cover the energy demands of residential and commercial applications as well as industrial processes without a loss of comfort or quality. They **offer a real opportunity to close the gap between the current ambition level and the climate and energy targets of the EU and the world.**

The EU-funded project 'Next generation heat pump for retrofitting buildings' (GREENHP) is addressing these challenges by developing an advanced heating system with minimum environmental impact using air/water heat pump technology that is both economically and environmentally viable.

Due to limited space in cities, heat pumps should be integrated into existing buildings and must be compatible with pre-existing heating systems. In addition, installation and running costs must be sufficient to make the changeover to heat pumps in urban areas economically attractive.

The GREENHP project is designed to be retrofitted to multi-family or commercial buildings with a living area of around 600 metres squared. It is based on a variable capacity air/water heat pump and is capable of supplying up to 30 kW of heat for space heating and domestic hot water. Air/water heat pumps are cheaper than ground-coupled heat pumps as they are much easier to install.

Moreover, researchers are developing the concept for combined operation with a photovoltaic and solar thermal system and investigating the use of propane as an alternative refrigerant. They will also demonstrate how an air/water heat pump unit can interact with large energy systems, such as a smart grid environment in particular. In addition, the use and storage of energy will be rationalized.

The research undertaken in this three year project is based on a comprehensive multi-level research approach ranging from innovative heat pump components to advanced system integration concepts.

The main research objectives on the three research levels of the GreenHP project are as follows:

Component level:
- New heat exchanger concepts based on brazed aluminium micro-channel heat exchangers including bionic refrigerant distribution
- New compressor concepts
- Optimized fan and air flow systems including advanced anti-icing and defrosting methods

Unit level:
- Refrigerant charge reduction
- Heat pump design enabling high efficiencies

System level:
- Building integration concepts including a photovoltaic and solar thermal system
- Holistic control strategies for the system
- Energy management concepts for smart grid integration

Potential Impact:
The expected results of the GreenHP project include:
- to prove that air/water heat pumps can be a most significant future heating and cooling technology for retrofitted buildings in densely populated areas and cities
- to demonstrate the possibility to substantially reduce refrigerant charges in air/water heat pumps thus promoting the use of alternative refrigerants
- to show how air/water heat pumps can be integrated into larger existing systems with other renewable energy technologies

green Heat Pump

- to demonstrate how controls of an air/water heat pump unit should work in a 'Smart Grid' environment
- to highlight the use of air/water heat pump units for heating and cooling in multifamily and commercial houses
- to pave the way for widespread adoption of the system in urban areas

The potential impact of the GreenHP system comprises:

- to enhance significantly the energy efficiency of heating and cooling systems for the use in multi-family houses in urban areas

- to enhance the application range of heat pumps by focusing on high capacity air/water heat pumps and heat pumps with alternative working fluids including their cost effective integration into larger systems

- to rationalize the use and storage of energy

The consortium consists of nine partners: three research institutes (Austrian Institute of Technology, KTH, Fraunhofer ISE), five industrial partners (Emerson Climate Technologies, Hesch-Schröder, Ziehl-Abegg, AKG and Gränges, and one association (European Heat Pump Association).

Project partners are confident that the GREENHP heat pump system will have a major impact on the European building sector by providing a new technical solution for efficient heating. To make the greatest impression possible, the consortium will disseminate its results not only to heat pump manufacturers, but also architects, urban planners, installers and end users. Therefore, GREENHP will make a significant contribution to a sustainable energy system and eventually, cities free of CO_2 emissions.

For more information please visit www.greenhp.eu

District heating and cooling enable transition to low carbon cities

By Antti Kohopää

POPULAR SOLUTION IN FINLAND

In Finland, 46% of commercial, public and residential buildings are heated by district heating and over 50% of new buildings choose district heating. Customers choose district heating, because it is competitive and future proof solution. Finnish district heating and cooling (DHC) are service products. By choosing district heating and cooling, customers outsource heating and cooling production to an energy company. In future, DHC will be even more than producing and transmitting heating and cooling to buildings. Energy companies together with their partners will take care of customers' energy use. A bigger share of income of district heating companies will come from services for customers and improving the living conditions of customers.

Finnish district heating and cooling is developed on a commercial basis and funded by customers through energy bills. Customers should not be obligated to connect district heating or cooling nor should companies be obligated to connect customers. Service market is under development at the moment. Between 2009-2013, annual average growth (CAGR) of district heating related service market has been approximately 30% and profitability over 10%.

In Finland, the growth of DHC business or service business is not regulated. DHC, related services and smart appliances will be in place when market actors – customers and providers – are ready.

COOLING FROM THE COLDEST COUNTRY OF THE EU

Despite the fact that Finland is the coldest country of the EU, it has one of the most rapidly increasing district cooling sectors in Finland. District cooling is developed for customer demand by eight district heating companies located in different parts of Finland.

Demand is driven by customers' expectations for better indoor quality, better insulation and bigger windows for new buildings, as well as higher internal heat loads like electrical appliances during the year. In Finland, district cooling is produced mainly by using heat pumps and by free cooling from cold sea water. Absorption heat pumps and chillers are used as well.

RENEWABLE ENERGY AND CO2-REDUCTIONS BEHALF OF CUSTOMERS

Finnish district heating is on its way to a carbon neutral future. During the past four years the share of renewables in district heat production has increased from 18% to 35%. Finnish Energy has estimated that, by 2030, the share can be above 50%.

Furthermore, over 70% of all district heat is produced in combined heat and power plants. Combined heat and power plants reduce one third of CO_2-emmissions compared with the situation where the same amount of heat and electricity would be produced separately.

Existing or new customers do not need to invest in renewables because DHC-companies do it for them.. Therefore there is no need to support or compel DHC customer to invest in on-site production of renewable energy.

DISTRICT HEATING AND COOLING ARE UNDER COMPETITION

District heating and cooling providers are in competition which means that customers have the option of choosing their supplier. For example in Sweden and Finland, main competitors are individual heat pump suppliers, while in many central European countries individual gas boilersuppliers are competitors. District cooling companies compete with heat pump and chiller suppliers. Therefore it is crucial that policy does not distort the competition.

The EU emission trading systemis a good example of such distortion, where district heating is covered while gas and oil usage in individual boilers are not.. In addition, some EU countries have many policies like taxes, building regulations, regulated energy prices and support mechanisms which weaken the competitiveness of DHC towards alternative solutions. Hopefully, these will be analyzed and removed in the future – then there will be an opportunity for more customers and countries to enjoy the benefits of district heating and cooling.

RENOVATION OF BUILDINGS IS POSSIBILITY FOR DISTRICT HEATING AND COOLING

Renovation of building stock creates huge possibilities for district heating and cooling. A comprehensive renovation of building stock is the best chance to sell district heating and cooling for customers and cities. Even elaborate and cost efficiently renovated buildings need heating and cooling. Renovation of buildings is good for district heating and cooling.

In Finland, where the market share of district heating is high and building stock is relatively new, the specific consumption of district heated buildings decrease by 1% per year. In countries where buildings are older and the market share of district heating and cooling is lower, the potential might be different.

DISTRICT HEATING NEED FUNCTIONING MARKETS TO BE COMPETITIVE

Combined heat and power production is a key technology in achieving climate and energy targets. In future, CHP will need both, a competitive heat market, as well as a competitive electricity market.

The shift from existing regulated and distorted market to a competitive market starts by removal operating subsidies for renewable and fossil energy sources. Second step would be liberalizing the heating, cooling and electricity market rather than try to facilitate the market with regulation.

ehpa european heat pump association

Towards a decarbonised and efficient energy system: A call for action and a pledge for contribution

Heads of States and governments as well as stakeholders from civil society are meeting in Paris to come to an agreement on how to limit global warming to 2°C.

Countries around the world have submitted their Intended Nationally Determined Contributions (INDC's). While this is an important progress, recent evaluation shows that the level of ambition is too low to achieve the target.

Oftentimes, budgetary concerns are used to explain that a specific country can simply not afford to take action. At the same time, the amount of subsidies still paid to the use of fossil fuels is tremendously high.

Heat-pump technologies can cover the energy demands of residential and commercial applications as well as industrial processes without a loss of comfort or quality. They **offer a real opportunity to close the gap between the current ambition level and the climate and energy targets of the EU and the world**[1].

Heat-pump technologies' **potential can become reality, pending policy makers correct the highly distorted energy market**.

The European heat pump industry calls Heads of States and governments for action!

1. **Correct the energy market by creating a strong price signal** (i.e. a financial bonus) to the benefit of those technologies that have low carbon emissions and use renewable energy;
2. Execute Member States' decisions to **phase out fossil fuel subsidies as soon as possible**;
3. **Set a compulsory share of renewable energy, reduced energy demand and CO_2 emissions** in future regulation governing the thermal energy demand of new or existing buildings.

We are convinced that these measures will transmit a proper signal to private, commercial and institutional investors and will align individual investment decisions with the global CO_2 reduction targets.

You cannot afford not to act and we have solutions to help!

More on heat pumps in Europe: cop21.ehpa.org and www.ehpa.org

Signed by:

AFEC asociación de fabricantes de equipos de climatización
AFPAC Association Française pour les Pompes A Chaleur
ASSOCLIMA ITALIAN ASSOCIATION OF HEATING, COOLING AND VENTILATION SYSTEMS MANUFACTURERS
ASOCIACE CZECH PRO VYUŽITÍ HEAT PUMP TEPELNÝCH ČERPADEL ASSOCIATION
bwp Bundesverband Wärmepumpe e.V
DHPA DUTCH HEAT PUMP ASSOCIATION
Fördergemeinschaft Wärmepumpen Schweiz FWS
NOVAP NORSK VARMEPUMPEFORENING
PORT PC
RE-Energising the Future COP21 RENEWABLE ENERGY TRACK
SVENSKA KYL&VÄRMEPUMP FÖRENINGEN
sulpu The Finnish Heat Pump Association
STROJÍRENSKÝ ZKUŠEBNÍ ÚSTAV, s. p.
WÄRMEPUMPE AUSTRIA
wpp warmtepomp platform

1 Today's heat pumps use renewable energy, reduce final and primary energy demand and reduce greenhouse gas emissions. Their installation results in local employment and when connected to smart grids, they facilitate a large share of RES electricity by providing demand response capacity.
2 The pledge to phase out inefficient fossil energy subsidies is among others, part of the pledge of the G20 meeting of energy ministers in Pittsburg, USA, 2009. It is also an integral part of the European energy union (Communication from 18.11.2015) See .

Smart windows today and tomorrow

By Frank Koos, Secretary General of EuroWindoor AISBL and Deputy General Manager of the German Window and Facade Manufacturers' Association (VFF) (pictured)

SMART WINDOWS TODAY

Windows have developed at stunning speed over the last few decades. Few components have been the object of as much innovation as the trusty window – especially when one considers what it replaced: Neolithic cave entrances, and empty semicircular openings in Ancient Roman buildings. Even in the 1970s, virtually all buildings were still single-glazed. But soon – prompted by rising energy prices, the spectre of climate change, and building users' demands for greater comfort in their homes and workplaces – "smart" windows began to emerge. Suddenly there was a call for better energy efficiency, more daylight, and greater comfort and convenience – and manufacturers needed to think how windows could help in achieving these goals.

Insulating glass units, more energy-efficient installation techniques, new types of coated glass, smart glass configurations, and innovative ventilation and solar shading concepts all had their part to play in the success story that followed. Then came windows that could actually generate their own power, thanks to solar heat and photovoltaics. However, a truly "smart" window today must also be part of a modern building automation system – for example enabling ventilation and solar shading to be controlled automatically – and be integrated into the building

services network of the building as a whole. In today's smart houses, smart windows need to "communicate", via the building services network, with users and other technical installations and devices, in order to respond automatically to the users' lighting, ventilation, temperature, sound insulation and privacy needs.

A remarkable new apartment building called the "Aktiv-Stadthaus" was recently inaugurated in Frankfurt. It is an example of an "active house plus", meaning that it not only uses energy extremely efficiently, but its state-of-the-art windows and photovoltaics actually produce an excess of energy that can be stored in e.g. electric cars[1].

Windows have become hugely more energy-efficient in recent decades, as demonstrated by the following: 40 years ago, the Uw-value of a typical single-glazed window (i.e. the thermal transmittance of the entire window) was 5 W/(m²K), compared to less than 0.8 W/(m²K) for a state-of-the-art triple insulating glass unit today. In

Frankfurt, inaugurated in summer 2015, is the largest energy-plus residential building in Europe. Designed by HHS Planer + Architekten from Kassel, Germany, it perfectly combines high-efficiency passive insulating materials (north side) with active energy generation (south side).

"Smart as smart can be" – photovoltaics, solar shading, etc. on the south-facing facade of the Aktiv-Stadthaus in Frankfurt.

Photo: EuroWindoor-PCL

other words, windows today lose 5 times less heat than they did 4 decades years ago. However, to determine the real energy performance of a window, the solar gain needs to be credited against the heat loss (U-value) to give an "equivalent U-value" (or "energy performance value"). Obviously this figure varies greatly depending on the orientation of the facade in which the window is installed: windows on a south-facing facade will generally be more energy-efficient than even a well-insulated wall.

CURRENT SMART WINDOW PROJECTS

It is against this background that the first "European Smart Windows Conference" (an initiative of the European Commission and part of the "World Sustainable Energy Days") took place in February 2015 in Wels, Austria. As Secretary General of EuroWindoor, I gave a talk at the conference entitled "LCEA from an industrial point of view – challenges & benefits" (LCEA = "Life Cycle Energy Analysis"), in which I looked at the problems of using life cycle analyses (as demanded today by EU research projects) for comparing different products. Often the datasets used in LCEA calculations do not allow meaningful comparison, due to differences in boundary conditions or in the products' technical performance. If project decisions are taken on the basis of misleading LCEAs, the project can produce flawed products. In addition, the product's entire life cycle needs to be considered; current approaches for assessing sustainability take account not just of environmental quality at the building level, but also socio-cultural and economic quality.

A major part of the European Smart Windows Conference was devoted to presentations on a range of current EU research projects in the field of smart windows. One such project was "HarWin" ("Harvesting solar energy with multifunctional glass-polymer windows"), for whom EuroWindoor is the "Industry Advisory Board". The following is an excerpt from the official project description[2]:

In HarWin new materials will be developed with the aim of constructing next-generation windows that will significantly improve the energy efficiency of windows and buildings. They will enable window functionality to be extended beyond the current European state of the art. The improvements will be achieved through reduced weights, reduced thermal conductivities and energy consumption, reduced material usage, and monitoring of the windows' life cycle environmental performance. New additional functionalities, e.g. window-integrated functional coatings, will be combined with intelligent phase-change materials and novel glass-polymer composites with wavelength management capabilities.

The new materials will combine heat and moisture control

thanks to new laminate and fibre-reinforced structures for the glazing, and integrated lightweight framing for windows. In the long term, the windows developed in HarWin will enable the creation of a new type of building in which the merging of functionalities currently assigned separately to windows and architectural glass will result in a new definition of the multifunctional facade, adjustable according to geographic and cultural needs."

Apart from HarWin a number of other smart window projects are also underway in Europe, including:

• **Winsmart:** This goal [i.e. the building industry's 2020 energy efficiency targets] will be achieved through a new vacuum-insulated glazing (VIG) solution combined with new, robust, switchable glazing systems mounted in a durable and energy-efficient sash and frame.

• **Smartblind:** The SMARTBLIND project aims to develop an Energy-Efficient Smart Window including a hybrid film consisting of an electrochromic LC film and a photovoltaic film both printed on the same long-lasting flexible substrate.

• **Mem4win:** The goal of MEM4WIN is to introduce a novel Integrated Glazing Unit (IG Unit) for quadruple glazing containing ultra-thin glass membranes for use as frameless openable windows for direct application in facades. New, tempered ultra-thin glass membranes (thickness attained so far: 1.3 mm) are employed. Thanks to this approach U-values of 0.3 W/m²K can be achieved, reducing weight by more than 50% and costs by 20%.[3]

A BRIGHT FUTURE FOR SMART WINDOWS

These projects give some indication of what the future might hold for smart windows. Certainly, virtually all windows in the future will offer high energy efficiency and energy gain as the absolute minimum.

On top of that come technologies that will allow windows to respond automatically to the needs of the building occupants. As mentioned above, only once that is achieved will smart windows truly become an integral part of the "smart house". Today's "intelligent" cars are perhaps the best indicator of the direction in which smart technologies are moving. They adapt to the road surface, the lighting conditions, the traffic flow, the person sitting in the driver's seat, and the weather – to name but a few of their already well-established functions. Based on this, it is safe to assume that plenty of exciting new developments still lie ahead for the "smart window".

1. More information on the Aktiv-Stadthaus in Frankfurt is available on the website www.abg-fh.com/bauen/aktuelle-projekte/aktiv-stadthaus.html, including various downloads (German language only)
2. www.harwin-fp7.eu/
3. The project descriptions are taken from http://amanac.eu/thematic-areas/smart-windows/

Market-based energy-transition through innovation

By Michael Mieszczanski (pictured), EU Affairs Advisor, European Network of Transmission System Operators for Electricity (ENTSO-E)

Electricity is essential to our economy and modern way of life. It keeps society functioning and our economies operating and growing. The power system – delivering electricity whenever we need it – is thus one of the core infrastructure of any society. In Europe notably, the power system is in the midst of transformative change. By 2030 the share of renewable energy sources (RES) will grow beyond 45% of the EU's total annual demand – up from today's 30%. Most of these are volatile (wind and solar photovoltaic (PV)); they are decentralised, connected to the power system at distribution level (especially solar PV) or further away from consumption centres (especially true for onshore and offshore wind). We also observe significant increases in self-consumption, electrification of heating/cooling and transport as well as large-scale roll-out of smart meters in some countries. New stakeholders and market players get on board and develop a wide range of opportunities for customers, who have to be present in all markets. In other words, the power system is going through a paradigm shift.

All this increases system operators' unique position of responsibility towards society to ensure the reliability of the power system. Transmission system operators (TSOs) respond to this through enhanced co-operation within and beyond ENTSO-E, improving planning and the operation regionally and at pan-European level. However, as the physical reality of the system evolves, the electricity market design also needs adjustment to incentivise market behaviour in line with the physical needs of the power system. On the latter aspect, the imperative for TSOs across Europe is to reconcile markets with the 2020 and 2030 sustainability agendas and to make the best use of innovation, putting empowered customers centre-stage.

INNOVATION ALLOWS CONSUMERS TO ACTIVELY PARTICIPATE IN THE ELECTRICITY MARKETS

To keep the system in balance, demand must become more flexible; i.e., customers must be enabled to respond to market signals. However, if this flexibility was imposed on the customer, quality of life and industrial and commercial productivity could suffer greatly. Fortunately, innovation in information and communication technology (ICT) is providing tools, which empower customers to make their own choice on how flexible they are with their electricity demand. Large industrial and commercial customers can continuously manage their consumption and also their system services. Alternatively, they can set the parameters and leave the day-to-day management to a service provider or their electricity supplier. Through these choices and parameters, customers are managing their demand much more actively than in the past.

Among the most important obstacles to consumer participation in many countries, is the lack of enabling 'hardware': smart meters, which are needed to deliver accurate information on cost and consumption as the starting point for active customer participation. When the hardware is there, consumer billing needs to shift from static consumption profiles to actual, time-stamped consumption and billing.

Another precondition for customer participation in the market is the incentive to do so. The increasing proportion (some 30-35%) of fixed charges, taxes and levies of the average final household electricity bill reduces the relative savings for households from decreasing wholesale prices. Whenever possible, these costs must be reduced or transformed into more dynamic market components.

To link up wholesale and retail prices, TSOs and DSOs

(distribution system operators) have already launched joint initiatives for closer cooperation in relevant areas such as data management. However, we do believe that Europe-wide or regional rules are needed to facilitate access to flexible sources at the distribution level to all markets.

A FUTURE-PROOF MARKET DESIGN MUST BE BASED ON EFFICIENT PRICE SIGNALS

Renewables drive innovation, and renewables necessitate innovation: The more RES we have in the system, the more the system has to be sophisticated, responsive and flexible. Therefore, empowering consumers alone will not suffice. The market design needs adjustment and price signals need to be strengthened. The updated market design must reveal system costs and the value of services delivering adequacy, flexibility and resilience.

We therefore believe that scarcity prices—wholesale price spikes reflecting temporary scarcity situations (e.g., periods of low wind or solar and high demand)—are central to enabling the future market design to ensure power system adequacy and resilience, and to mobilise effective end-consumers' participation in markets.

Scarcity pricing entails unconstrained price formation in all market-timeframes (day-ahead, intraday and balancing) to reflect the real cost of electricity. In this context, the reference to such a need in the joint declaration of the Pentalateral Forum of 8 June 2015[1] is a positive sign.

Since more frequent scarcity prices will expose market participants to new financial risks, this will trigger the market to develop corresponding risk-hedging products. These products will allow market participants to mitigate their financial risks while also providing more stable investment incentives. One example is the recent launch of intraday cap futures by EEX[2].

Likewise, the market needs adjustment to move renewables onto a level playing field with other technologies and let them bear the same responsibilities (in particular balancing responsibility) as other market participants. They also have to be exposed to price signals, in particular when we see negative prices at wholesale levels. Subsidies for mature RES technologies should be phased out or – if still necessary in the future – they should be designed in a way that minimises the market and operational impacts and be sufficiently co-ordinated across Europe to support trading or participation across borders. To move in this direction, renewables have to get better trading opportunities, which they currently lack in some markets.

INNOVATION IS UNDERPINNING THE MARKET-BASED ENERGY TRANSITION

The power system's need for flexibility is enormous and another important way of making the system more flexible is energy storage. TSOs are neutral with regard to the various energy storage technologies. However, it should be noted that only hydro-pumped storage is competitive enough in the present market environment and that the current hydro-pumped storage capability in Europe is limited. The role of innovative storage solutions, such as power to gas or small-scale storage, have game-changing potential that need to be realised.

Innovation is an important enabler of the energy transition. Innovation comprises more than just technology; it also encompasses both process and business model innovation. However, due to a lack of research and development incentives for TSOs in several countries, innovation efforts across Europe are very heterogeneous. The regulatory model for TSOs is based on national oversight to ensure cost-effective delivery for local consumers. This poses challenges for fostering the required participation of TSOs in the innovation to underpin the large-scale transformation of the power sector.

Likewise, a significant innovation potential lies with new actors from the ICT sector, independent aggregators, 'prosumers' and storage solutions. The TSO community thus needs to be prepared for game-changers such as low-cost local storage and must be prepared and able to define the cooperation with these actors.

While learning and knowledge can be achieved and shared from local to pan-European level, it is necessary that a specific pan-European power system innovation is enabled. The funding mechanism to allow for this evolution challenges the existing regulatory model.

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1. Joint Decleration for Regional Cooperation on Security of Electricity Supply in the Framework of the IEM
2. https://www.eex.com/en/about/newsroom/news-detail/eex--trading-of-cap-futures-to-begin-on--14-september/89880

The role of Battery energy storage in the new energy market design

By Francesco Gattiglio, EUROBAT (pictured)

After the publication of the Energy Union Strategy[1] and the Communication on New Energy Market Design[2], the European Commission is about to propose in 2016 a package of legislative measures that could reshape the way European energy market works. In this package, battery energy storage (BES) might finally see recognized its importance and its potential to empower citizens to take an active role in the energy transition, increase the necessary flexibility, favoring the deployment of renewables and the stability of the grid.

To fully deploy renewables and untap their potential to ensure a stable and secure energy supply, Europe needs to work to overcome the limits of renewables. Renewables are not a constant source of energy, and depend on unstable weather conditions. So far, the integration of renewables into the electricity grid has posed important challenges in terms of stability and continuous availability, and with the growth of the share of renewables these challenges will become more and more relevant.

Batteries can solve these problems storing energy from on-peak renewable energy and discharging it when it is more needed on central, de-central and off-grid situations. Moreover, batteries can also offer grid services like voltage control and frequency regulation, maintaining grid stability, offering flexibility services and security of supply. All four batteries technologies – lead, lithium, nickel, sodium – can provide distinctive and important functions to grid operators and have potential for significant further technological and economic improvement.

The consultation process on new market design and the debate on the Energy Union are thus important steps for the creation of a more balanced EU energy market. It is fundamental to take into account the contribution offered by new technologies such as battery energy storage, removing legislative barriers and creating the correct incentives to modernize the energy market.

One of the key provisions of the new energy market design might be electricity prices reflecting scarcity. This would represent an important market signal for demand-response, smart appliances (including electric vehicles) and storage solutions like batteries. Flexible electricity prices would stimulate energy efficient and smart solutions, now hampered by regulated prices. Besides, it will be important that electricity prices will reflect transmission costs: storage solutions could be used for transmission congestion relief, deferring expensive investments and extending the life of the existing transmission infrastructures. Transmission costs integrated in the final cost of electricity would allow a fair market selection of the most efficient solution.

A general problem of storage in the current energy market is the lack of an agreed definition of energy storage at EU level. On the practical level, this has two direct consequences: first of all, since most of the EU countries consider storage as a generation facility, it is not clear if Transmission and Distribution System Operators (TSOs and DSOs) are allowed to own storage facilities. This

uncertainty is clearly a formidable barrier for investments of TSOs and DSOs, the actors that could use storage to better balance and stabilize the grid. Defining energy storage as a separate asset would improve market conditions for take-up of market technologies, and should work towards enabling utilities to own and operate those technologies within their asset portfolio.

Additionally, energy storage is today often defined as generating facility, but in some cases storage systems are also treated as end consumers, resulting in double fee imposition. Direct additional taxation on energy stored for self-consumption should also be avoided, as it represents a strong dis-incentive to the deployment of energy storage.

A proper, well-functioning balancing market should also be a key element of the new energy market design. One of the problems faced by storage is the insufficient or non-existing reward of ancillary services such as frequency regulation and voltage control, an important part of the business case for storage. It will be fundamental for the European Commission to promote a regulatory framework able to include rewards for grid services and the overall capacity of energy storage to stabilize quality and supply for renewables generation. The balancing market should also allow the participation of small and individual producers or aggregators, as well as of any other actor in the energy market. An appropriate regulatory framework for aggregators is also needed to allow their participation to the market.

Overall, it will be of capital importance to remove unnecessary barriers to tools ensuring the proper integration of renewables. For instance, curtailment of renewable energy is simply energy waste. Curtailment of renewable energy should always be avoided where and when possible. Storage systems can substantially reduce curtailment rates absorbing renewable energy when needed. Grid constraints naturally preventing renewable energy from having priority of dispatch could be addressed through the deployment of BES.

The new energy system will see the presence of new actors, the deployment of distributed generation and increasing production of instable renewable energy. Designing a legislative and regulatory system able to properly address these challenges will not be an easy task for the Commission. Nevertheless, it will be fundamental to take advantage of existing tools and systems able to facilitate the transition to the new energy system. In this context, batteries are part of the solution and will play an important role in the European energy system if the barriers to their deployment will be removed.

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1. European Commission Communication "A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy", 25/02/2015 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2015:80:FIN
2. European Commission Communication "Launching the public consultation process on a new energy market design", 15/07/2015, http://ec.europa.eu/energy/sites/ener/files/documents/1_EN_ACT_part1_v11.pdf

Building blocks for Market Design

By Patrick Clerens, Secretary General, EASE the European Association for Storage of Energy (pictured)

ENERGY STORAGE CHALLENGES

In 2009 there was no such thing as a regulatory framework for Energy Storage (ES). This is why the European Commission launched an Energy Storage Task Force and why, in the aftermath of this Task Force, a group of European leading players in the energy sector – incl. manufacturers, utilities and academic bodies - decided to come together and found EASE in 2011.

Since then, both the energy system and EASE have come a long way. Energy Storage is the talk of the town – Electric Cars, PV+Storage, Empowering Prosumers, Smart Cities & Smarter Citizens, Demand Side Management - and not a day goes by without an article or conference about it. But that regulatory framework for Energy Storage - which the Commission was after and why those leading players created an association - is still not complete.

EASE has taken a look at the current energy system and regulatory framework and has come up with a list of hurdles that would need to be overcome in order to achieve the full integration of Energy Storage and the full realisation of its potential.

ENERGY STORAGE DEFINITION

The basic need, in order to create a legal framework dealing with Energy Storage, is to have an Energy Storage definition on EU level. Without it, energy storage cannot be included in legislation– such as the upcoming EU legislative "Winter Package" – and no true regulatory framework can even be conceived. This is why EASE worked over a year to create a definition that is accepted by all stakeholders and has been shared with the European institutions, encouraging them to either provide us with comments or help us disseminate this definition as wide as possible in order to potentially adapt and gather a consensus around it.

"An "Energy Storage Facility" for the electricity vector means a facility used for the intake and stocking of electricity in different suitable energy forms. The release of this energy, at a controlled time can be in forms that include electricity, gas, thermal energy and other energy carriers."

An important aspect of this definition is that, although it has been limited to the "electricity vector"[1], it covers all known energy storage technologies (and there are quite a few of them) and is general enough to allow for the integration of innovations to come, a.o. since it is not defining specific services, which could evolve over time. This technology agnosticism is fundamental for EASE, and we would encourage institutions and regulators alike to take this same approach.

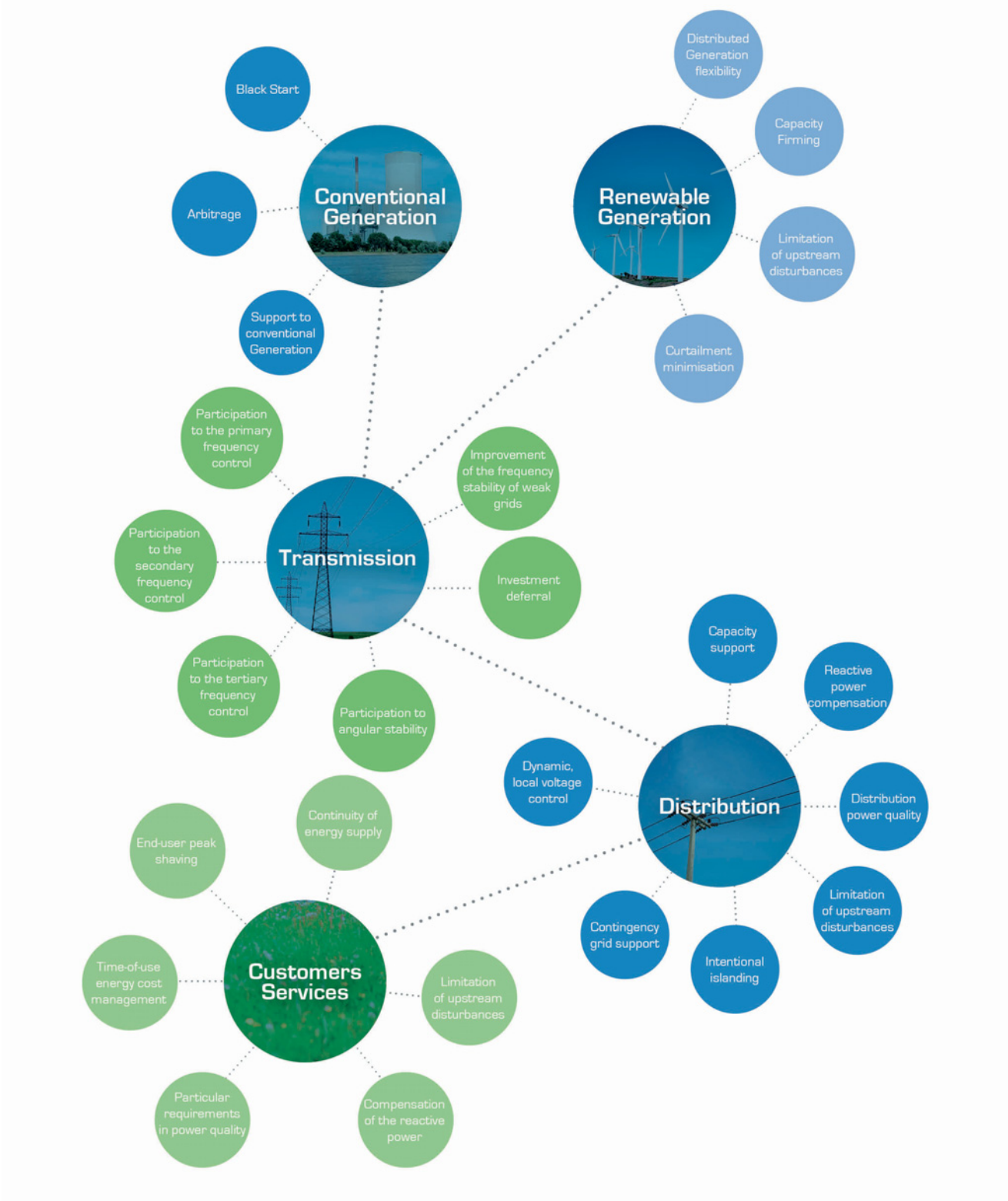
EUROPEAN INTERNAL ENERGY MARKET

Now that we have begun to tackle this particular hurdle, it is time to look ahead, and a good place to start is the European Internal Energy Market (IEM), the completion of which can be considered paramount for the full integration and realisation of energy storage. The creation of a competitive level playing field will show the variety of applications energy storage can perform, and will prove (and demand!) the market readiness of its technologies.

An important factor therein is the recent Market Design Consultation. In it, energy storage is finally recognised as being able to render the above mentioned services and applications. Additionally, EASE is thrilled to find that this Market Design Consultation includes a few features EASE has been trying to insert in the European legislation.

1 There are currently three different Energy Vectors used accross the EU: Electricity, Gas & Heat. ES has applications within all vectors and often serves as a gateway between them.

Adding value along the energy system



The European Energy Storage Technology Development Roadmap towards 2030 was published jointly by EASE and the European Energy Research Alliance in 2013 and features the EASE High Level Market Design Recommendations

No double payment of Grid Fees and Taxes for Energy Storage

Storage is both a consumer (charging) and a generator (discharging). This leads to storage operators often having to pay double fees, levies and taxes for both the charging and discharging of energy, preventing storage projects from being economically viable and thus rolled out on the market.

It also prevents storage to be operated in line with system needs. Additionally, the situation differs from Member State to Member State, which creates further distortion for the allocation of storage. Studies by regulators (e.g. CREG, the Belgian regulator) exist that demonstrate how the different fees and taxes applied to ES devices strongly reduce the income from ES business models for all configurations operating with a connection to the Grid.

A Market-based approach is preferable

Such an approach allows long-term price signals and short-term markets as well as scarcity prices. Price fluctuations will have a high potential to properly remunerate flexibility and capacity options like energy storage, as long as all energy storage technologies are allowed to participate in all mechanisms

All generators should be in the market

One of the "raisons d'être" of Energy Storage is the integration of intermittent RES into the grid. Alternatives to the current subsidies for RES should be found and these should be harmonised at EU level, incentivising intermittent generation to follow the market and to get support using market rules; meaning that the energy must be sold on the market. Non-discriminatory access to technologies which can facilitate the economic growth of renewables (like energy storage) should be facilitated with market based regulation, assuring that the benefit is delivered at the best cost.

Disclaimer: This response was elaborated by EASE and reflects a consolidated view of its members from an Energy Storage point of view. Individual EASE members may adopt different positions on certain topics from their corporate standpoint.

The European Association for Storage of Energy (EASE) is the voice of the energy storage community, actively promoting the use of energy storage in Europe and worldwide.

EASE actively supports the deployment of energy storage as an indispensable instrument to improve the flexibility of and deliver services to the energy system with respect to European energy and climate policy. EASE seeks to build a European platform for sharing and disseminating energy storage-related information. EASE ultimately aims to support the transition towards a sustainable, flexible and stable energy system in Europe.

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Heat gets smart in Aarhus

By Kaj Leonhart Petersen, M.Sc.Eng., senior energy planner and a partner in Danish consultancy EC Network

At the end of 2014 the City of Aarhus, Denmark, signed the last contract with the meter supplier Kamstrup to complete the rolling-out of smart heat meters to 53,000 district heating customers by 2017. This is part of the city's planned intelligent energy system, contributing to the goal of becoming CO_2 neutral in 2030.

Denmark has set the goal to get a society without use of fossil fuels in 2050 and be 100% based on renewable energy. The smart grid is an important part of this strategy, to allow for greater exploitation of electricity generated by renewable energy sources and encourage consumers to use energy more efficiently. The Danish energy system has a very high share of renewable generation. The wind power generation is equal to more than 39% of the Danish electricity demand (2014), and is planned to reach 50% penetration in 2020.

In 2013, the Danish Ministry of Climate, Energy and Building published its strategy setting the course for development of a smart grid. A key element of the strategy is the deployment of hourly read meters to all consumers in 2020. In 2013, smart electricity meters were installed for about 50% of consumers. This accounts for about 75% of electricity consumption.

The smart grid will also be incorporated into the gas and district heating grids as part of an integrated smart energy system. Denmark has extremely well developed district heating and gas grids and therefore there is a good basis to exploit the synergies between the different types of energy and grid.

As regards district heating the smart heat meter project in the City of Aarhus is one of the front runner projects. To learn further about this project ManagEnergy visited Aarhus in 2013 to hold a workshop on cost effective metering (in cooperation with the European Commission's Joint Research Centre and Directorate-General for Energy). http://www.managenergy.net/networking_meetings/1286

ROLLING OUT "SMART AARHUS"

Today, district heating in Aarhus covers 95 % of the total need for heating in the city. By 2015, 100 % of the heat production will be based on carbon-neutral biofuel and waste, helping the City of Aarhus to be CO_2 neutral in 2030. This solution is part of the future on an overall intelligent energy system and demonstrates the thinking behind the initiative "Smart Aarhus", where

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Communication is key, Erik and a colleague at AffaldVarme Aarhus explaining how the system workscomparison between electricity, water and heating usage

public and private companies and knowledge institutions collaborate to make digital data about the city available to citizens, city authorities and industry.

Aarhus's smart metering project is driven by AffaldVarme Aarhus, the local district heating company. AffaldVarme Aarhus is currently in the process of rolling out smart heat meters to 53,000 customers (2012 - 2017), which affects around 350,000 people in the Aarhus region. The new intelligent heat meters automatically transmit the heat consumption to the supplier, replacing the annual self-reading of the individual households. It will be one of the world's most advanced remote meter reading systems.

The first 13,300 meters (installation completed by February 2014) were supplied by Kamstrup, who also installed the second lot of 10,500 meters (completed in December 2014). In November 2014, Kamstrup won the final round of tenders for 28,000 meters (to be completed by 2017). The project costs €32.6m (243m DKK). Just over 40% of that is funded by the customers paying an additional €8 (60 DKK) per year. The remaining 60% is funded by AffaldVarme Aarhus through the optimisation of operations.

Anticipated gains from the new smart meter system include administrative benefits for AffaldVarme Aarhus in terms of billing and budgeting. Operationally, the district heating company expects to be able to reduce water and heat losses and increase reliability of service. At the ManagEnergy workshop, Katrina Marshall (EC Network) interviewed Erik Brender and Katrine Svanborg to find out more about the project.

According to Erik Brender, project manager at AffaldVarme Aarhus: "Currently, we are losing 283m3 water per day which costs us around €480,000 (3.6m dkk) per year; we expect to reduce this loss by a half. Smart meters measure energy used, cubic metres used and the temperatures. By combining these three parameters, you can figure out very accurately how much a customer needs to pay for the energy used in the building. More accurate pre-billing is one of the main benefits we gain from this smart meter roll out."

"The data can also be used to benefit budgeting at AffaldVarme Aarhus. With the live data now available we can go online and click for a specific area and know how much heat has been used in that area over the last month. This information will help to bridge the gap between the heat that AffaldVarme Aarhus buys and sells."

eButler Interface showing a comparison between electricity, water and heating usage

INNOVATIVE PARTNERSHIPS

EMT Nordic and Saseco (in 2014 Saseco merged with Kamstrup) are key partners in delivering the IT systems needed for data collection and management. EMT Nordic is responsible for 'EnergyKey' which is a database of all customers, the transaction kernel which transfers data to and from many sources. The system has been developed as an open interface for possible future integrations, for example to visualise other utility usage.

"A huge challenge is that utility companies are developing their own platforms rather than working together or using a platform that is already developed. Currently, it is only possible for private households to enter their consumption data manually," said Karina Svanborg, Energy Anthropologist at the Danish Technological Institute, and part of the team monitoring customer reactions to the smart meters.

Project partner Saseco (now Kamstrup) has developed a tool called eButler which allows customers to have access to all of their own data. This empowers the customer and, and is hoped, will motivate energy savings through behavioural change.

According to Karina, "The first hurdle is encouraging customers to log into their eButler account to find their consumption data. Once shown how to log into eButler, most of the customers are really intrigued by the data and often surprised by how detailed it is. People see their lives in the data; "this is when I got home", "this is when my son came home", etc. "

"When looking at the data for heat some people also start talking about "this is when we turned on the TV" and can start confusing heating with electricity. It emphasises the importance of being able to see information about electricity and heating (and water) on the same platform, so that customers can visually see the difference."

Project manager Erik Bender said: "AffaldVarme Aarhus has a demo which shows how eButler

About Aarhus:
http://www.aarhus.dk/da/omkommunen/english.aspx

The City of Aarhus, an intelligent energy society:
http://www.co2030.dk/da/CO2030-in-english.aspx

About Aarhus, State of Green:
http://www.stateofgreen.com/en/Profiles/City-of-Aarhus

Visit Aarhus:
http://www.visitaarhus.com/ln-int/denmark/tourist-in-aarhus

European Capital of Culture (ECoC) in 2017:
http://www.aarhus2017.dk/english

could be used with all utilities integrated. For this, electricity and water consumption have been manually entered. By knowing additional information about the house, the platform comes up with a rating for electricity and energy consumption. This allows the consumer to know where their focus could be for improvements."

"For municipality buildings we can use other means to gain information about water and electricity data which can be fed into the platform through Energy Key. By using this "back door" we are able to present the full data set on the eButler platform. We hope that this will encourage the other utilities to get involved so that we don't have to use the "back door" anymore."

SMART GRID LIVE LAB IN STENDERUP, DENMARK

Fifty kilometres south of Aarhus there is a little village called Stenderup (Horsens Area) serving as a trial site for the smart grid system (Insero Live Lab). The trial site involves upgrading the homes of 20 families to the intelligent home of the future with the latest technology within energy and ICT - linked together and managed via a local smart grid. The families will test the technologies in real life and develop them further in close cooperation with suppliers, producers and manufacturers.

This includes testing the Ebutler software used in the Aarhus Project as well as the iESA Software (Interactive Energy Savings Account) developed by the German company Senercon in relation to energy management based on smart heat metering (gas meters). Insero Live Lab is run by the Insero Horsens Foundation. The MangEnergy partner EC Network is involved to help with testing the iESA Software in close cooperation with the 20 families.

The activity is done in the framework of FINESCE (Future INtErnet Smart Utility ServiCEs) which is the smart energy use case project of the 2ndphase of Future Internet Public Private Partnership Programme (FI-PPP) funded by the European Union within FP7.

Replicability is of particular interest due to the requirements of Articles 9, 10 and 11 of the Energy Efficiency Directive, with a number of new provisions (which came into force in 2014 across Europe) on metering and billing of individual consumption of heating and cooling.

What works in Aarhus, however, may not be immediately replicated in other cities. Erik Bender said: "In Denmark there is a lot of confidence in the government and systems; people aren't worried about data being measured on their homes. Culturally, this can work for Denmark because of that trust. We had a discussion at the workshop with participants from other countries who said that one of the main concerns is that they are hesitant about having this level of data available. For them it will be about finding a balance and being very transparent about what the data will be used for."

According to energy anthropologist, Karina Svanborg, "When it comes to residential customers, the American electricity company O-Power have found that competition between neighbours and areas can be effective in reducing energy use. This is an idea AffaldVarme Aarhus are considering for their customers too. One of the main concerns is of the sensitivity of data when you have to keep data for this type of purpose."

"It is very important to prioritise the security of the data on this platform. The data is sensitive because it gives insight into people's lives; it is relatively easy to extract information about when people are using heat and when they are not at home. There is a lot of information that can be used and misused."

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ManagEnergy is an EU-funded initiative supporting local and regional sustainable energy actions. Learn more at www.managenergy.net

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