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SUMMER 2017

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EUSEW – SUSTAINABLE ENERGY WEEK

THE ENERGY UNION

Includes editorial contributions from:

Dominique Ristori
Director-General for Energy
European Commission

Morten Helveg Petersen
Member of the European Parliament

Monika Hohlmeier
Member of the European Parliament

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Energy

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Foreword

Much happened between the Summer of 2016 and the Spring of 2017: murderous terrorist action across Europe, a new US President, and the launch of the Commission's Winter Package. The UK spent its first day since 1880 without having to burn coal, while on one day, Germany generated 85% of its electricity from RE: not a windy island with a small population, but a global industrial powerhouse. However, the period marks arguably the most significant of all these stories: the UK's decision to leave the EU.

Meanwhile, the world warms.

EEI is delighted that Dominique Ristori has written again; and that he has used the opportunity to emphasise that clean energy is no longer a choice, but a responsibility for all of us. He stresses the vital role of EUSEW in bringing together pioneers, businesses, academics and research centres – and civil society. Reminding us of the key elements of the Winter Package, he concludes that we need awareness of the challenges and opportunities ahead – and the sustainable energy projects and ideas presented at EUSEW. In the same vein, Kristian Ruby argues that Europe must show the way on climate action, illustrating his point with the key role of the transport sector and citing the "clear climate benefit" of the shift from petrol. He goes on to argue for proposals to ensure the necessary charging infrastructure for electric cars through minimum requirements for buildings. On the theme of European collaboration, Tiit Jürimäe reviews the achievements of the first Clean Sky programme. In the nine years since its inception, thousands of experts have cooperated in 20 large Demonstrators, completed by 600 participants in 24 European countries, to evaluate thousands of components used in current aircraft and helicopters. The common goal? Reducing noise and CO_2 emissions, so pursuing European societal demands for a better quality of life. Meanwhile, Monika Hohlmeier MEP asserts that Clean Sky has been "an unambiguous success story not only environmentally, but also in establishing a robust innovation network". But there is no hint of complacency in her upbeat article: she makes the case for budgetary certainty so that, appropriately-funded, our ambitions can be realised.

In an article that manages to be both technical and fascinating, Cecilia Bonefeld-Dahl explores the energy performance of computer servers. She warns that the Commission's efforts to limit "idle state" power consumption may have the unforeseen consequence of driving energy consumption in data centres upwards by at least 10%; and possibly by as much as one third.

We also publish a thought-provoking article by Pierre Jean Coulon. The clue is in its title: "An Energy Union for European citizens". In exploring the concept, he notes that the work of the European Economic and Social Committee is itself based on the principle that energy has now become a basic necessity, without which decent life as we know it is impossible. Energy costs and security of supply therefore underpin the wellbeing of society – that is, of all of us.

Though sanguine, we must remain sanguine: the English language has blessed this word with two meanings: "bloody" and "hopeful". Amidst all the bloody carnage wrought by the enemies of democracy, now is the time for hopeful unity of purpose. Not, despite Brexit, for political grandstanding, or talk of punishment and divorce bills.

And there is a lot more for you to read inside…

Michael Edmund
Editor

EUSEW and energy efficiency

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

Dear readers,

This year's EU Sustainable Energy Week is taking place after the entry into force of the Paris Agreement and the publication by the European Commission of the Clean Energy for All Europeans package. The clean energy transition is no longer a choice for Europe; it is a responsibility towards all citizens, our future generations and the planet. It has to be driven forward steadily and wisely. At the same time, energy transition also represents a real economic opportunity.

The 2017 EU Sustainable Energy Week (EUSEW) taking place in Brussels from June 19 to 25 brings together clean energy pioneers, sustainable energy businesses, academics and research centres as well as civil society: EUSEW is the biggest and most-well known event of its kind in Europe. It represents the ideal place to advance innovative ideas, exchange on best practices and connect clean energy stakeholders to join forces in driving forward the energy transition. During the 3-day Policy Conference (20-22 June), workshops will provide information on the latest policy developments and help to identify remaining obstacles and challenges. On top of that, the Sustainable Energy Awards will be given to the most innovative and promising clean energy projects. I remember how impressed I was by last year's winner, Green

Brewery Goess, with its inspiring example of brewing green and sustainable beer with the support of hydropower, biomass district heating and solar thermal energy on its production premises. With their vision of becoming the first major beer brewery to reduce CO2 emissions to nearly zero, Green Brewery Goess shows us that sustainability is increasingly becoming a key priority for businesses all over Europe.

As such, EUSEW takes on a vital role in the realisation of the EU's Energy Union. The most important step in this direction was taken last November when the European Commission published the *Clean Energy for All Europeans Package*. With the proposals on the table, energy efficiency has been put first, the objective of becoming global leader in renewable energies has been confirmed, and the package is also aimed at providing a fair deal for all European consumers.

The first goal is actually very simple – energy that is not consumed does not pollute and does not need to be imported! Thus, placing energy efficiency first on our agenda will play the most important role in decreasing greenhouse gas emissions. In this context, as part of the Clean Energy package, the Commission is proposing to increase the ambition level for energy efficiency and to have a target of 30% binding at EU level for 2030.

We place particular importance on the buildings sector as it accounts for almost half of Europe's energy consumption. Significantly speeding up renovation rates of Europe's building stock is an important element in this context. Furthermore, with our proposals, buildings will not be passive objects that consume energy, but will become an active part of our energy system, by producing and storing renewable energy onsite. Smart buildings are also broadly recognised as a major enabler of future smart and renewable-intensive energy grids. Smart buildings can help not only to adapt energy behaviour to the situation of the energy grid, but also maintain or improve the comfort and lifestyle of those that live in them. However, the uptake of smart technologies for buildings needs to be stimulated. This is why our proposal for amending the Energy Performance of Buildings Directive introduces a smart indicator that will reliably quantify the capabilities of buildings in terms of connectivity and intelligence, focusing on three areas: energy optimisation, interaction with building users, and participation in demand-response schemes. This indicator will raise awareness of the added value of smart technologies and will encourage cost-effective investments in smartness, leading to a circle of improvement of the EU building stock.

We are also enabling and empowering consumers to become more active. By encouraging smart metering, consumers will be increasingly equipped to better follow and adapt their energy consumption to the energy market price. It will also become easier for them to participate in the clean energy transition themselves by investing in their own energy production, which can be more easily fed into the grid.

District heating is another perfect example where energy efficiency gains can be garnered in both energy generation and energy use. The EU's Energy Efficiency Directive currently focuses on the technological and economic aspects: it requires all Member States to analyse how much of their heating needs could be met by district heating. The proposal of the Clean Energy package goes a step further: We now also focus on consumers of district heating by requiring Member States to offer clearer and more frequent information on the energy consumed for heating, especially for multi-apartment buildings.

Finally, energy transmission and distribution networks can become more energy efficient by reducing electricity losses, gas leaks and compression losses and by adapting to a growing share of renewable energy generation. An upgraded electricity grid will help to minimize curtailment, harmonise divergent generation and consumption patterns, improve stability and security, and promote cross border balancing.

The Commission will not be able to do all this alone, but we will need engagement from all parts of society. And to do this, we need to raise awareness of the challenges and opportunities ahead. This is why I am looking forward to many great sustainable energy projects and ideas, presented at the EUSEW 2017! Meanwhile, I invite you to discover the EUSEW at: http://eusew.eu/

Unlocking energy investment in private houses

Up-scaling investments in energy efficiency and renewable energies for buildings is a major challenge to meet 2030 EU targets. National, regional and local administrations have to innovate in the application of public funds in order to rise the leverage of investment that ESIF, and other public funds, can generate in the energy market.

Unfortunately, most of ESIF and public incentives are currently used with non-returnable grant systems. Non-returnable grant policies are showing important weakness compared to other schemes, such as more complex Financial Instruments (FIs), so regional authorities have a key role to play in moving to other support policies which are proving more cost-effective.

Extremadura region is coordinating 2 EU initiatives for the promotion of FIs for energy renovation of multifamily houses, covering 14 EU regions, which will develop pilot FIs supported by ESIF. This initiative, called FINERPOL, is funded by Interreg Europe Programme with 1,9M€ ERDF.

The use of ESIF, especially ERDF, in the generation of new FIs for energy efficiency in buildings is a main challenge for the current period 2014-2020. Especially when Regions try to combine these FIs with other EC funding initiatives, such as EFSI, and wants to leverage the public investment through public-private partnerships, by including private financial institutions in the mix.

Finerpol aims to launch a pilot FI in Extremadura in 2017, for multifamily houses with central heating, which have been identified in the ex-ante assessment as a locked investment with a market potential higher than 70M€.

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District energy – from good intentions to tangible results

By Steen Schelle Jensen, Head of Product Management, Kamstrup

Everybody's talking about it: the potential of district heating and cooling in an energy efficient future. But who or what is going to ensure that it is fulfilled? The current revisions of EU energy legislation in the Winther Package is a positive expression of great intentions – and the higher the ambitions, the better the results.

The potential of district energy is not only broadly recognised, but has been positioned by the European Commission as key to reaching our future energy targets. The ongoing revisions of the directives on Renewable Energy (RED), Energy Efficiency (EED) and the Energy Performance of Buildings (EPBD) bode well and represent a step forward in the district energy sector.

In the legislative framework, it is primarily EED articles 9-11 and 14 together with article 7 in the RED, that are to drive the challenge of turning potential and good intentions for district energy into tangible results. If done right, the updated legislation will provide the basis for an energy supply that is efficient, secure and green.

END USERS AT THE CORE

Following the New Deal for Energy Consumers, end users have been placed comfortably at the centre of the Energy Union, and the adaptation of articles 9-11 on metering and billing information is set to further empower European consumers. Increased transparency from clearer consumption information and advanced technology including smart meters, will enable them to better understand and reduce their consumption saving both money and energy.

This is in itself a positive development, but while it may be driven by the end users, transparency from smart metering brings with it major improvement opportunities for utilities as well. These include operations optimisation, enhanced asset management and digitalisation. Ultimately, smart meter data enables smarter decisions.

TURNING ASSESSMENTS INTO ACTION

Article 14 directs member states to carry out a comprehensive assessment of the potential for district energy based on the use of heating and cooling from waste heat and renewable energy sources. Assessments have been completed in most member states but vary in quality and vision due to limited knowledge and experience with district energy in some countries. At best, they outline a blurry starting point rather than provide a clear view of the finishing line. The challenge now is to qualify these assessments based on the extensive research performed by e.g. Heat Roadmap Europe, and to then define specific actions. Here, strong national commitment will be the lever for further development of district energy.

THE END OF THE BEGINNING

In the efforts to sharpen the current proposals, neither member states nor the European Parliament should fear biting off more than they can chew. Research combined with best practice from more experienced nations prove the potential and vital role of district heating as the corner stone of the integrated energy system of the future – so bite away. This is our chance to ensure that today's legislation gets us to where we need to be.

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Energy Efficiency: Hunting for the low-hanging fruits

By Morten Helveg Petersen, MEP,Vice-Chair of the Committee on Industry, Research and Energy

Energy efficiency first! This is the core principle of the energy strategy for Europe, and for the "Clean Energy for all" package launched by the Commission by the end of 2016. This principle acknowledges that Europe's biggest domestic energy source is energy efficiency and highlights the importance of solutions that take into account energy savings.

This is the right priority. But it has to go hand in hand with ambition, and in my mind we should be way more ambitious than the energy efficiency target of 30% for 2030 as proposed by the Commission. You cannot call for ambition and then sit on your hands. You have to practise what you preach, and that is why I see it as my job and a job for the rest of the European Parliament to make the case for raising the level of ambition and the binding energy efficiency target to 40% for 2030.

As Vice President of the ITRE committee, rapporteur for the revision of the ACER regulation, and shadow rapporteur on the revision of the Energy Performance of Buildings Directive (EPBD), I am facing the challenge of strengthening and translating the energy efficiency principle into each paragraph of the eight proposals of the Clean Energy package.

Buildings account for approx. 38 % of the overall energy consumption in the EU and 75% of EU's buildings stock is still energy inefficient. In other words, buildings are low-hanging fruits in terms of efficiency and energy savings. We have to speed up the process of renovation and further look into expansion of district heating and cooling, which would lead to greater energy efficiency and lower GHG emissions.

The low-hanging fruits in terms of energy savings through the ACER regulation is perhaps not as apparent as the energy savings of renovating our building stock. On paper, it is "just" a regulation of an agency that facilitates the cooperation between national energy regulators. However, the gains from improving the cross-border cooperation and the efficient use of the capacity of the energy network is huge. We need to use every opportunity possible to live up to our commitments from the Paris Agreement and the 2030 EU Climate and Energy framework.

One way of harvesting is by improving the efficient use of energy generation capacity. Right now, there are indications of overcapacity of energy generation in Europe in spite of decline in conventional generation capacity. Numbers from 2015 show that on average 28% of high-voltage alternating current interconnector's physical capacity is available for trading in 2015 according to ACER. In plain English; only a small part of the physical capacity is actually used, and this is primarily caused by the lack of regionally developed capacity methodology.

We do not need more capacity to generate energy on an EU level. What we need is to use it better by at all times using the lowest-cost capacity and balancing energy cross-border. Estimates from 2013 show that a common balancing market would amount to a gain of 600-900 million euro per year. Although these numbers may be a bit outdated, they nevertheless illustrate the clear benefits of improving the efficient use of capacity.

To obtain this, we need a well-functioning market, where clean and inexpensive energy flow freely across borders provided and supervised by a well-functioning Agency (ACER).

By putting efficiency first, other benefits will follow; cost savings, growth, thousands of new jobs and healthier living. Moreover, Europe will be less dependent on Russian gas and of oil from the Middle East.

The Clean Energy package is a unique opportunity in terms of and make all these benefits realities. Let us go to work.

BAMB
BUILDINGS AS MATERIAL BANKS
Co-funded by the Horizon 2020 Framework Programme of the European Union

Buildings As Material Banks: Where are we now?

The EU funded BAMB project, Buildings As Material Banks, brings 15 partners from 7 European countries together for one mission – enabling a systemic shift in the building sector by creating circular solutions (see first presentation of the project in EEI of Summer 2016).

The project is developing and integrating tools that will enable the shift: Materials Passports and Reversible Building Design – supported by new business models, policy propositions and management and decision-making models. During the course of the project these new approaches will be demonstrated and refined with input from 6 pilots.

The BAMB project started in September 2015 as an innovation action within the EU funded Horizon 2020 program. A great deal of progress has already been made and rich exchanges have taken place with stakeholders via the BAMB Stakeholder Network and Special Interest Groups, now counting approximately 275 members. In additional to topic specific workshops, the Annual Meeting of the BAMB Stakeholder Network was held on the 24th of January in Brussels. Interactions and input from stakeholders has contributed to shape the development of tools within the project.

MATERIALS PASSPORTS

Important steps have been taken towards achieving the use of Materials Passports. Following the completion of a user requirements analysis, a Software Platform has been developed to support the generation of, and access to Materials Passports. The vision for Materials Passports has also been described as part of the Framework for Materials Passports, which serves as a tool to explain passports and give them additional context. Initial steps to begin generating 300 passports within the project have also been taken, testing and refining the platform and framework in the process.

Picture of the New Office Architecture pilot in Essen, Germany
© kadawittfeld architektur

TOOLS FOR REVERSIBLE BUILDING DESIGN

Additional technical developments have occurred in the area of reversible building design. Significant steps have been taken in the development of the Re-use Potential Tool, which will enable the assessment of building structures' reuse potential - at the system and component level - in order to preserve buildings' and their components' and materials' residual value, fostering high quality reuse. The tool is to be used by a variety of actors interested in the construction of buildings as materials banks - system and product developers, architect and engineering offices, demolition contractors, building owners and investors. In addition to providing a score for reuse potential varying from high level reuse (100% reuse) to low level reuse (10%), the tool will also address information about disassembly characteristics of building structures.

PUTTING TOOLS TO THE TEST IN BAMB PILOT PROJECTS

New tools developed as part of the BAMB project are being put to the test over the course of the project by way of testing in 6 real-scale construction and renovation pilots. All pilots have begun to perform a feasibility study in which the objectives of the actions regarding Material Passports and reversible building design are being studied on a theoretical level.

The different scenarios and choices will be described. An analysis of all construction aspects needed to implement these objectives will be made. This study will be used as a basis for the prototyping and the construction of the pilots, since it will be developed and used as the construction dossier. The study is to be completed in the summer of 2017.

Picture of the VUB Van Der Meeren student housing, Circular Retrofit Lab in Brussels
© Stijn Elsen & Anne Paduart

POLICIES TO SUPPORT A CIRCULAR CONSTRUCTION INDUSTRY

To facilitate future applications and exploitation of BAMB results, recommendations for policies and standards will be developed later in the project. Progress already made includes mapping existing policies, standards and regulations in 4 European countries as well as at the EU level, and the writing of a report which summarizes the effect of the identified mechanisms on the transition towards a circular construction industry. This report has been discussed with stakeholders in a Special Interest Group workshop in order to confirm initial conclusions, as well as to begin identifying best practices around the globe to further inspire future recommendations. Currently exploration of best practices and an impact assessment of existing policies is under way to identify success factors to be applied to future policy suggestions.

DEVELOPING A SHARED VISION FOR THE FUTURE

The BAMB partners aim to tackle systemic barriers. Motivating the work done towards achieving technical and policy solutions, the Consortium is collectively identifying and investigating the barriers and opportunities of the current system, while developing a shared vision and blueprint for a future system configuration. The Synthesis of the State of the Art Report is now available for download on the BAMB website. This report, *Key barriers and opportunities for Materials Passports and Reversible Building Design in the current system*, is a snapshot of the current system as perceived within the BAMB Consortium. Key questions addressed include: Why are design/build for change and circular economy not yet (fully) integrated in the current building practice and related policy? and What are the main barriers and opportunities within the current system for implementing Materials Passports and reversible building design protocols? **Go to www.bamb2020.eu/topics/overview/state-of-the-art for the whole report.**

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An Energy Union for European citizens

The European Economic and Social Committee, one of the progenitors of the concept

By Pierre Jean Coulon (pictured), President of the Section for Transport, Energy, Infrastructure and the Information Society (TEN) of the EESC

The Energy Union is one of the European Commission's top priorities, the strategy for which was launched in March 2015. The EESC had already issued an opinion in January 2012 (I was the rapporteur) calling for the establishment of a European Energy Community – an idea close to Jacques Delors' heart – and for civil society to be involved in this process. The Energy Union has many similarities with this initial concept for an Energy Community, in particular the idea that energy challenges need to be treated as interconnected issues, and addressed in a spirit of solidarity.

Our work is based on the principle that energy has now become a basic necessity, without which there can be no business and, indeed, no decent life at all (including health, education, training, trade and industry, and access to other needs such as water and telecoms). Energy costs and prices, and security of supply, thus directly affect people's well-being and the competitiveness of businesses large and small.

This is why the EESC has been closely involved in the process of developing the Energy Union. The Committee has published 23 opinions directly related to this initiative, and it is not done yet. Its opinions have addressed both general aspects such as the establishment of the Energy Union, and more sector-specific aspects.

Discussions between the EESC members themselves, and with their counterparts in the Member States, experts, all stakeholders and the other European institutions, have revolved around five main themes:

- civil society's broadly positive response to the general idea of the Energy Union;
- concerns about prices and market distortions;
- the importance of acknowledging the social and societal dimension of energy transition;
- a focus on vulnerabilities and prospects for consumers; and
- the need for civil society to be involved in governance of the Energy Union.

THE CONCEPT OF THE ENERGY UNION

In its opinions, the EESC has:

- underlined the need for an Energy Union in light of the challenges facing Europe's economies, not least their heavy dependence on external energy supplies (still nearly 60%);
- highlighted the overall importance of the Energy Union for Europe's political project, presenting the free movement of energy as the fifth EU freedom; and
- stressed the importance of political will and vision, shared by the institutions and by the Member States, in achieving Energy Union.

While the EESC takes a positive view of the concept, there are a number of aspects that in my opinion merit further attention by the European institutions and Member States.

ENERGY MARKET DISTORTIONS AND PRICES

The proper functioning of the energy market – particularly the electricity market – is a key challenge. Prices are set almost solely by the market (or markets?). And prices shape the behaviour of households and businesses, as well as of investors.

It is therefore important to get the prices and market design right. The EESC therefore, while welcoming the Commission's recognition of the need for a fundamental transformation of energy markets, given the ever-increasing use of renewable energy and the new opportunities offered by digitisation:

- regrets the continuing existence of direct and indirect subsidies that are harmful to fair competition, and stresses the need to reform the emissions trading system in order internalise certain external costs of energy sources; and

- echoes certain Member States that have been urging the Commission to recognise the increasingly important role of small-scale electricity producers, and to allow them to participate in energy markets by adjusting rules that were originally designed for large-scale, centralised energy production.

THE SOCIAL DIMENSION OF ENERGY TRANSITION

It is imperative to bear in mind that any transition – including the ongoing energy transition – will involve reshaping all economies, especially carbon-intensive ones, and will entail social, societal and economic risks for different groups and regions. It is therefore important to ensure that new "green" jobs are also decent jobs, in terms of social protection, health and safety, working conditions, and so on.

The EESC also stresses that affected workers must be given the assistance they need to retrain, to help them adapt to the new job profiles associated with these new energy options. While this is currently particularly urgent in the fossil fuel sector, especially coal, nuclear workers could in future find themselves in a similar situation if there is continued growth in these new types of energy.

The Committee has also expressed concern at the lack of real progress in tackling energy poverty, which affects more than 80 million people in the EU. I welcome the newly established Energy Poverty Observatory, which I called for in early 2015, and we are keen for the EESC to play an active role in it.

VULNERABILITIES AND OPPORTUNITIES FOR CONSUMERS ON ENERGY MARKETS

With its vision of an Energy Union "where citizens take ownership of the energy transition [and] participate actively in the market", the Commission is setting out a new role for consumers.

The EESC will take it at its word, not least with regard to the concept of prosumers (i.e. individuals or groups who produce and consumer electricity) and the increasing use of digital technology in the sector. For example, our Committee has observed that Europe's energy markets are already changing on the ground, with a significant rise in the number of prosumers of decentralised renewable energy: there are more than 100 000 even in France, with its highly centralised energy sector. This requires consumers to be able to participate actively in the market. It should also make rules and invoices easier to understand, and give all consumers, including the most vulnerable, access to the new opportunities offered by the growth of digital technologies.

CONSTANTLY EVOLVING LEGISLATION, DIALOGUE AND A CIVIL SOCIETY DIMENSION

Most of the progress made since the Euratom Treaty 60 years ago and in the ECSC has involved market liberalisation – which, to say the least, has not been a factor in lowering prices or in improving security of supply.

Efforts from now on must take proper account of the three dimensions of sustainable development: social, environmental and economic.

This new paradigm is clearly set out in the latest raft of measures on "Clean Energy for All Europeans".

This package includes a number of proposals that the Committee strongly believes should be targeted exclusively at the general public.

Improving the energy performance of buildings, for example, involves deploying the necessary funds to fit insulation and install new technologies in homes, businesses and administrative buildings. It will create a great many jobs, both directly and indirectly, and new activities for businesses throughout Europe.

The same is true of clean energy innovation, which needs to take account of various public and private initiatives and to connect and pool them at EU level.

Finally, as I mentioned above, this progress can only be real and tangible if it is based on solidarity:

- solidarity between the European institutions and Member States;

- solidarity between the Member States themselves - speaking with one voice on international energy issues; a continent-wide energy system that includes our Eastern, Balkan and Mediterranean neighbours, allowing for the free flow of cheaper energy; a low-carbon economy that helps to tackle climate change; an innovative, competitive and accessible energy technology sector; a larger skilled workforce for the energy system of the future; and targeted future-oriented investment.

This is the challenge: an Energy Union focused on the people, for the people – and by the people.

Airbus overlooking beyond the future of sustainable flight

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Alongside with technological innovations that enable Airbus to propose quieter jetliners with reduced fuel consumption, lower noise levels and fewer emissions which also perform at the highest level, reducing aviation's environmental footprint is one of the company primary challenges. Airbus pursues its road to air transport eco-efficiency, focusing on value and growth generation whilst creating less impact on the environment.

Airbus is engaged in an Industrial transformation to ensure anticipation and preparation for mid-term evolutions of industrial systems as well as the longer term solutions to build the Factories of the Future.

FRANCE, SAINT-NAZAIRE, A350 PAINT BOOTH OPTIMISATION

Across the company's industrial facilities, key reductions have been achieved in energy and water consumption, waste production, VOC (Volatile organic compounds) and CO_2 emissions. The priorities are to secure energy supply,

Project leader inspects the heat pumps providing ultra-low CO_2 heat to the A350 paint booth in Saint-Nazaire

AIRBUS

Sumatra palm oil plantations

improve energy monitoring, identify waste of energy in operations and develop and implement innovative solutions in order to anticipate energy and CO_2 trends.

The new A350 paint booths at St-Nazaire is a tangible example of best practice: designed and built to reduce environmental impacts to almost Zero, the project enables a 67% saving in energy use and a 86% reduction in CO_2 emission, leading the way for future energy reductions and achieving zero CO_2 emisssions from our industrial process.

EARTH OBSERVATION

Fighting global warming from space sustainable forest management

In the continuity of the Company's approach to fight climate change, Airbus, The Forest Trust (TFT) and SarVision have formed synergy from their knowledge base to develop STARLING, the answer to support efforts to reduce global footprint in terms of deforestation. Using spatial imagery and singular expertise, Starling offers an innovative solution that is efficient and economical to companies wishing to verify the impact of their actions in the field.

The combination of high resolution optical and radar satellites provides objective, frequent and precise observation essential for making informed decisions. Images are captured regularly, for the purposes of monitoring changes in various situations such as supply basins and expansion areas and allowing the various sector actors to ensure proper application of conservation and sustainable development policies.

Tomorrow's new technologies and Innovation remain key drivers to constantly reviewing environmental footprint and reinforcing eco-efficient ways of working.

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Energy Efficient Presidency

By Kaja Kallas, MEP

When people talk about energy prices they often like to say that the cheapest energy is saved energy. This is indeed very true. Thus, in order to save on our energy bills we have to find ways to limit our energy consumption. And in relation to that we need to talk about empowered consumers. Consumers can be empowered only when they are informed and can make choices on the basis of actual information about their consumption.

When discussions around the new clean energy package started, one of the great surprises for me was to learn that in many European countries consumers get their energy bill only once a year. How can you make informed choices when you only get information regarding your past consumption once a year? On this basis, one cannot decide if they made good or bad choices, e.g. if they could have used some appliances during non-peak hours.

This once-a-year arrangement is even more strange if you think about all the digital tools that are currently available to deliver the relevant data every day or even every hour. But data delivery can only be done if consumers have smart meters.

Estonia is the only country in the world with 100% smart meters. As the data is all running to the Transmission System Operator (Elering), it has created a data hub that can be accessed by all: consumers, producers, grid operators but also anyone who wants to build their new applications or services based on that data. Data hub (Andmeladu) holds all agreements related to electricity transfer and consumption and all measurement data.

Through the data hub electricity consumers can receive information on their electricity consumption points and their agreements, view past electricity consumption data and authorize one or more electricity sellers to access their data, so they can make personalized offers. Although the data is in a very readable format, people can also ask service providers to make them offers and choose between them. So we can really say that smart meters are smart not only for the producers and professional market players but also for regular consumers who want to bring their energy costs down. To those critics who say that such a data hub is difficult and costly to deliver I can give an interesting fact: the feasibility study to do the data hub in Norway cost more than doing the whole data hub in Estonia. So it is not a matter of costs but willingness.

Unfortunately, the European Commission has not been very ambitious in requiring the Member States the complete the roll-out of smart meters. The Third Energy Package provides that the implementation of smart metering may be subject to an economic assessment of long-term costs and benefits to the market and individual consumers. For electricity, Member States must proceed with smart metering roll-out to cover at least 80% of positively assessed cases on their territory by 2020; and prepare an implementation timetable for a period of up to ten years. This has still not been done.

If there is no push from the Commission and the Member States don't realise the benefits that their consumers might enjoy by being more informed, we may risk the non-realisation of the Energy Union, as some regions of Europe are better developed than others. Consumers in some parts of Europe enjoy making informed choices while others lag behind. In the former, markets also develop better, as consumers can easily change their supplier and so real competition is working between service providers. If the aim of the Clean Energy package is to make markets work, then informed consumers are the key to achieving this goal.

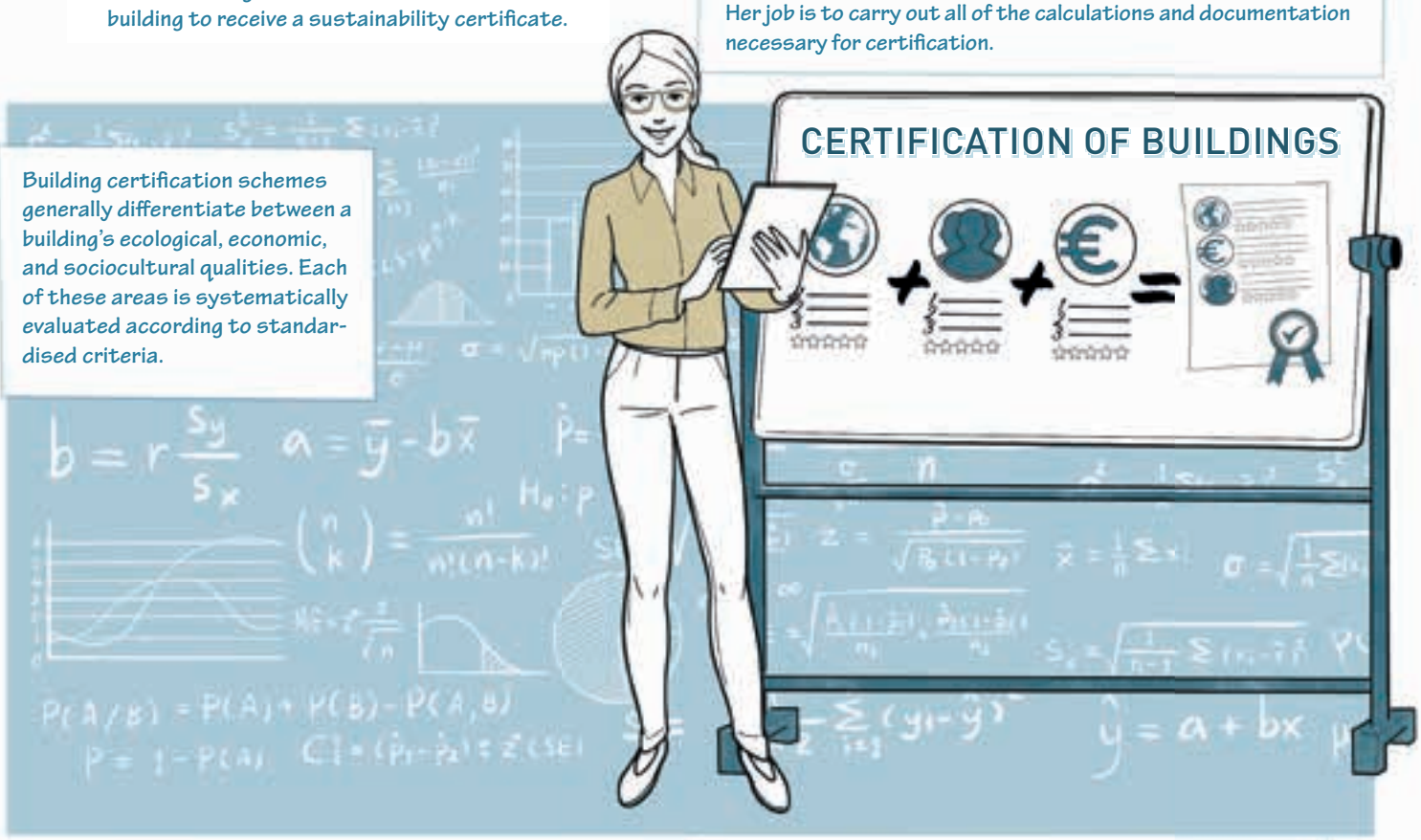
Estonia will take on the Presidency in July, and people in Brussels have high hopes for it - we are small, digital, and efficient, they say. So let's hope we will also guide Europe towards being more energy efficient.

SUSTAINABLE CONSTRUCTION
How does it work?

Mr Schneider is an architect and he has designed an office building for Mrs Müller, who would like her building to receive a sustainability certificate.

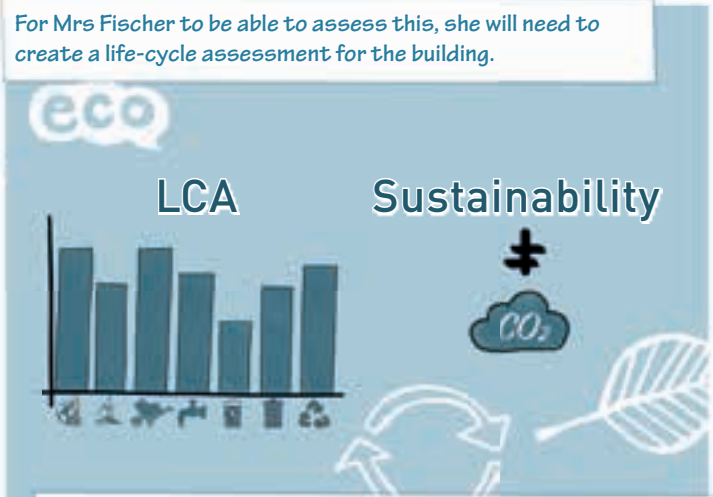
Mrs Fischer is an auditor for a building certification system. Her job is to carry out all of the calculations and documentation necessary for certification.

Building certification schemes generally differentiate between a building's ecological, economic, and sociocultural qualities. Each of these areas is systematically evaluated according to standardised criteria.



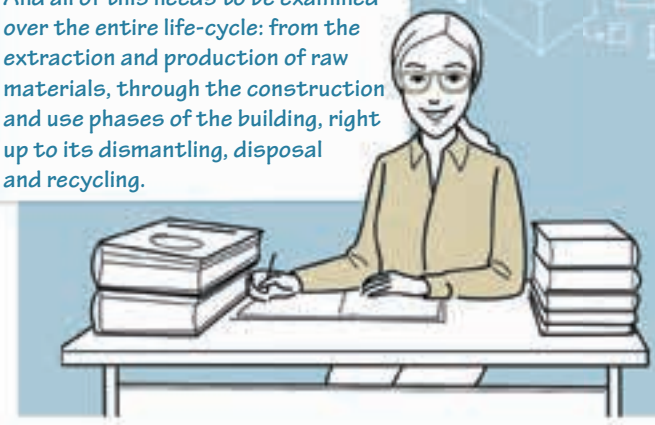
Let's look at an example: Environmental protection is very important to Mrs Müller. For her, the ecological quality of her building is the most important consideration.

For Mrs Fischer to be able to assess this, she will need to create a life-cycle assessment for the building.

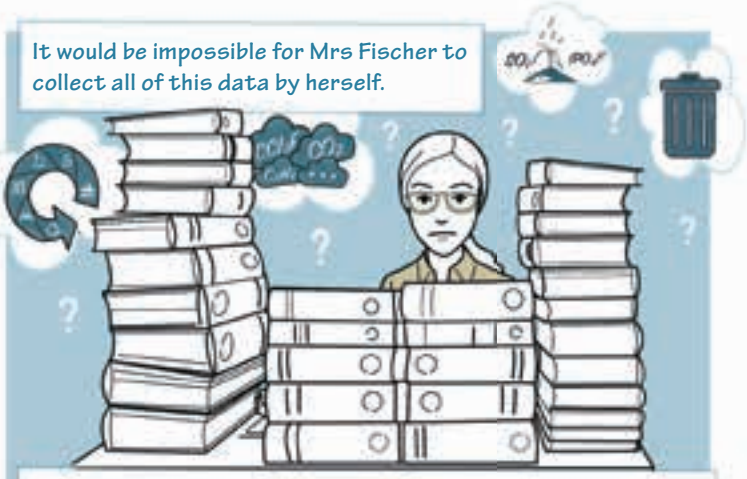


A life-cycle assessment is an internationally recognised, standardised method for analysing the potential environmental impact of processes, products, and even entire buildings – because sustainability cannot be broken down to just a single number, such as CO2 emissions.

To enable Mrs Fischer to create this life-cycle assessment, she will need detailed information about the building, and every individual product. And all of this needs to be examined over the entire life-cycle: from the extraction and production of raw materials, through the construction and use phases of the building, right up to its dismantling, disposal and recycling.

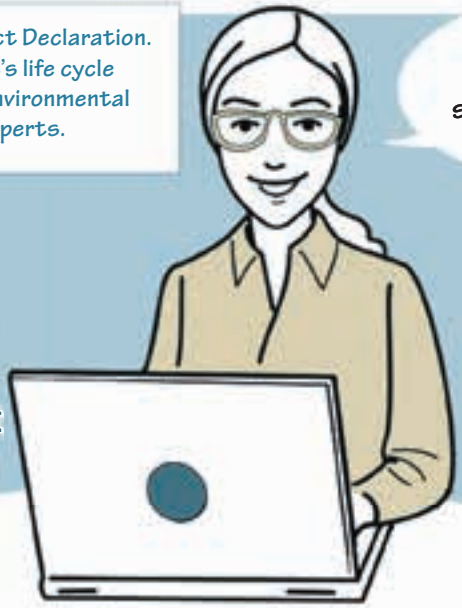


It would be impossible for Mrs Fischer to collect all of this data by herself.



So, how does Mrs Fischer get the life-cycle assessment data of the products, in order to calculate a building LCA with which to evaluate Mrs Mueller's office building?

The solution are EPDs –the Environmental Product Declaration. An EPD contains all relevant data from a product's life cycle assessment, assigned by the manufacturer to environmental impact categories and verified by independent experts.



Here I've got all the information I need for a sustainability certificate. Thanks to EPDs!

Systematic assessment

Independent verification

Accessible information

THIRD-PARTY **VERIFIED**

EPD

ISO 14025 and EN 15804

Institut Bauen und Umwelt e.V.

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NATCONSUMERS

OBJECTIVES

The residential sector accounts for a quarter of all energy consumption in the EU. Reducing household energy use across Europe is therefore critical to efforts to cut carbon emissions. However, altering the ways in which people use energy within their homes is difficult. It is not easy to change long-established habits, nor is it easy to target such a diverse population in order to help these changes come about.

Previous efforts to communicate with consumers have been very much focused on price or simplistic comparisons as means to motivate changes in consumption. These approaches are focused primarily on information provision, on the assumption that all humans are 'rational actors' who will respond to financial drivers. Through the NATCONSUMERS project however we have taken a new approach, based around understanding householders as individual people, rather than as homogenous, energy consuming agents. We thought we needed to start a conversation with the end customer. It's not about dictating to them and ordering people to do things, it's about creating a conversation.

To do this, the NATCONSUMERS project has developed a methodology for communicating with consumers using 'Natural Language' – communication which is friendly, emotionally intelligent, relevant and simple. The NATCONSUMERS tool is designed to raise awareness about how people use energy within their homes, and to give them advice about how to use energy more sustainably. Capitalising on the roll-out of smart-metering across Europe, the project utilises smart-meter data to provide tailored advice to householders.

TAILORING THE ADVICE

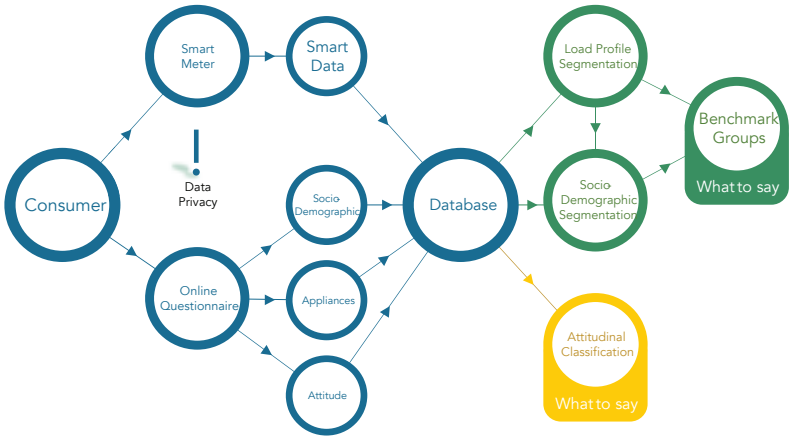
The underlying premise which NATCONSUMERS is built upon is that for energy efficiency advice to be truly effective, it must be tailored. Tailored advice has been found, through multiple studies, to be much more effective than more generic recommendations. Variations in consumers' characteristics and behaviours lead to heterogeneous energy demands, influenced by both individual preferences and physical variables. As such, if we are to change these energy demands, our advice must be similarly heterogeneous to ensure it is relevant and actionable for the consumer in question.

Moreover, advice must also be presented to consumers in Natural Language. This means that advice messages should be easy to understand, avoiding jargon or technical language, and should be communicated in a friendly, emotionally intelligent way. In order to communicate in Natural Language, we must ensure advice is both relevant and interesting to consumers. When determining what the content of a message should be, we must consider the household's context to ensure the advice provided is relevant to them. When determining how the message should be communicated, we must understand the consumer's attitudes and values, to allow the message to be framed in terms which will be of interest.

In order to achieve this, within NATCONSUMERS we have created three segmentation models. The first utilises smart-meter data to categorise consumers based upon their electricity load profile – i.e. based on their patterns of energy usage over time. This allows us to identify typical electricity usage profiles. The second segmentation is based on socio-demographics. This has been used to investigate how much electricity households use, or the total 'volume' of consumption. Combined, these two segmentations allow us to paint a picture of a user's overall energy usage, in terms of both patterns and quantities of use. Subsequently, this allows for users to be compared to other households with the same profile, i.e. comparison to a benchmark segment. The results of these two segmentations help to determine the content of advice messages – they allow us to identify what subject matter will be relevant to each household.

The third segmentation has been constructed from a survey of consumers' attitudes and values. From this, we can identify what interests each householder – for example, are they interested in saving money, protecting the environment, making their home more comfortable, etc. – and can therefore re-frame the message in

The flowchart of segmentation



NATCONSUMERS

terms that they will take note of. This segmentation therefore identifies how we should communicate with each individual.

CREATE AND DELIVER THE MESSAGE

The three segmentation models described above have been used to build the NATCONSUMERS Natural Language Generator. This generator inputs smart-meter data and consumer attitude data, and outputs Natural Language energy efficiency advice. This process relies upon a corpus of messages – a collection of potential narratives, each of which can be adapted based on the segmentation data derived in segmentation.

But messages could be delivered in a host of different ways. Traditionally, energy feedback has been centred on written information provided with the energy bill. More recently, new feedback delivery mechanisms have been developed, for example web-tools or mobile apps. In the future, a much wider array of feedback delivery mechanisms could become available. When developing NATCONSUMERS advice therefore, an appropriate mechanism for delivering the messages must also be developed or selected. These potential mechanisms are described as engagement concepts. Within the NATCONSUMERS project, we developed and explored a range of potential engagement concepts through a co-creation approach with designers.

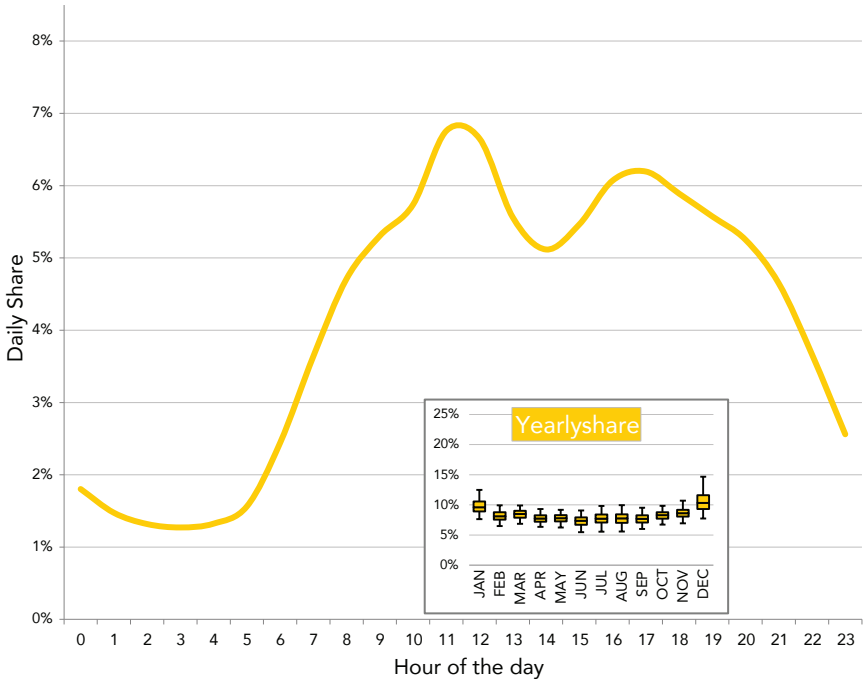
An engagement concept example – Energyland

The engagement framework is an important aspect of the NATCONSUMERS advice system. It needs to be developed with a consideration of the national context in which the tool is being applied, and with consideration of the type of message sender and also any specific features of the target group.

IMPACTS

The primary function of the NATCONSUMERS tool is, to help people save energy. This, in turn, has broader impacts in terms of reducing CO_2 emissions, lowering consumers' energy bills, reducing energy poverty in vulnerable households and improving the relationship between consumers and utility companies. Through the use of our tailored mechanism, which allows energy advice to be personalised for each individual user, we believe a 5-10 percent reduction in energy consumption in the residential sector is achievable. The NATCONSUMERS tool is, by its nature, directed towards the end-consumers of energy. But it is also by design an engagement tool, and as such has potential value also for many different market actors. ●

A load profile segment example – The Home Lunchers in Ireland



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 657672.

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Climate change: how digital grids help in mitigation

Laurent Schmitt (pictured) is the new Secretary General of the European power transmission system operators' association, ENTSO-E. With his experience as a strategy leader in digital grids business, notably for Alstom/General Electric, Laurent Schmitt explains how they can help Europe build its resilience against climate change. He wants ENTSO-E to facilitate the fourth industrial revolution in the energy sector.

Power networks are key in fighting climate change. They bring renewable energy to consumers. They will be part of this network of networks needed for the deployment of e-mobility, gas to power, etc. But they will also more and more connect consumers to consumers allowing millions of peer to peer transactions. And this transformation of the power system has great potential in reducing our carbon footprint.
By 2020, there will indeed be in the world more than 50 billion of devices connecting prosumers with each other. Constellations of prosumers' microgrids connected to one another will compose digital power systems enabling end to end transactions through blockchain. The sum of these systems interacting with each other will create the new *Digital grid*.

This requires a fundamental rethink of how the power system is structured. Bi-directional communication and flows, storage upstream and downstream the meter, as well as dynamic controls of flexible demand need to be enabled. Markets also are called to evolve to allow a new way of managing transactions along the energy value chain. From wholesale markets facilitated at transmission level, to market facilitation at distribution level and down to aggregation of prosumers' flexibility.

Digital grids will lead to new regulatory options, bringing new choices and incentives to electricity consumers and prosumers. Provided they opt in, consumers will be exposed to real-time electricity prices that will reflect scarcity of flexibility in the overall system. This in turn will help them make conscious choices.

HOW IS THIS 'POWER TO THE PEOPLE' HELPING FIGHT CLIMATE CHANGE?

European transmission system operators were again facing extreme weather conditions last winter with temperatures registered once in every twenty or fifty years. One suspects these severe weather conditions will increase as a consequence of climate change. Digital grids can not only help reduce our impact on climate but also build our resilience vis-à-vis the effects that we start experiencing.

I had the opportunity to directly contribute to setting up smart cities and neighbourhoods, putting in practice the *Digital grid* concept.

Projects like *NiceGrid* in France demonstrate that peer to peer

transactions with the right hard and soft ICT can significantly enhance the flexibility of existing grid infrastructures and contribute to running a system 100% on renewables.

By a combination of centralised and decentralised ICT on grid infrastructure, in control rooms, at grid's edge but also with cloud appstores, *Digital grids* allow for real-time assessment of grid congestion, security and asset conditions, thereby optimising the flows without endangering security.

They bring unprecedented scalability and computing capability for the management of the end to end energy system, from the control room to the prosumer.

WHAT ROLE THEN FOR ENTSO-E?

ENTSO-E and its members are engaged in this digital transformation. One of our IT projects, the Common Grid Model will for example allow bi-directional data flows between national operators and regional service centres. This is not real time information but information to improve the planning and forecasting of the grid operation. And this new environment supported by a tailor-made IT infrastructure, a standardised & automated information exchange is just a beginning.

Can ENTSO-E serve as a centre of excellence, a facilitator to accompany this industrial revolution? Are there opportunities to develop tools in common? Can ENTSO-E, through this facilitation, accelerate the deployment of *Digital Grids* in Europe and thus contribute further to the fight against climate change?

What is certain is that Europe has what it takes to make this digital transformation. The skills and industrial ecosystem are there. There are examples of regulations and policies which support the digital energy system. The recent Clean Energy Package in its active customer dimension is a step in the positive direction.

However, the deployment of innovation, new business models taking advantage of the latest technologies, should be even more favoured in Europe. I look forward to working in ENTSO-E and with our stakeholders to bring this *Digital grid* from promise to practice.

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A network for Ireland's low carbon future

"The Irish are renowned worldwide for their friendliness. However, despite that reputation for affability, we seem to prefer living as far away from one another as possible." So says Marguerite Sayers, Managing Director of ESB Networks, the electricity distribution operator in the Republic of Ireland, explaining one of the challenges of delivering electricity infrastructure in Ireland.

Ms Sayers explains that Ireland's scattered population made the electrification of rural Ireland, which took place between 1946 and 1976, a phenomenal undertaking. "It has been described by historians as 'the quiet revolution', given the lasting societal impact the arrival of electricity had on lives in homes, farms and villages across rural Ireland."

ESB Networks has been building on that proud legacy, in an understated but determined fashion. "Today, about one third of Ireland's population live outside of cities and towns, which creates challenges for ESB Networks. As such, Ireland has four times the European average of length of network per capita," says Ms Sayers.

ESB Networks has invested €6bn in the electricity system in recent years, driven by Ireland's commitment to source 40 percent of electricity requirements from renewable sources by 2020. "Part of this project focused on our low voltage network, converting 50,000 km of 10kV network to 20kV operation. As well as doubling the capacity of the network, the conversion resulted in energy loss savings equivalent of taking 15,000 cars off the road and constitutes the single largest energy efficiency project ever undertaken in Ireland."

ESB Networks has to-date connected more than 3,000MW of renewables to the system (which has an annual peak load of circa 5,000MW), much of this onshore wind farms located in remote locations on Ireland's western seaboard. Ms Sayers outlines the on-going European Union collaboration – primarily through Horizon 2020 funding - for many ESB Networks projects. "With a current TSO operational limit in Ireland at 60 per cent instantaneous penetration renewable generation, we are part of the EU RESERVE project that is exploring how to stabilise the electricity system for up to 100 percent renewables."

Through a separate EU project, EvolvDSO, ESB Networks is developing the tools to accommodate the growing distributed renewable energy sources in the generation mix, and the increasingly proactive demand for electricity.

Ms Sayers goes on to explain that, as we reduce electricity generation emissions, the electrification of heat and transport will be key to Ireland's transition to a low carbon future. "We are working on trials to assess the impact this increased electrification is likely to have on our low voltage system. The Plangrid EV project, again funded by Horizon 2020, looks at distribution grid planning and operational principles for mass electric vehicle roll-out while enabling distributed energy resource integration."

The control centre (above) and Marguerite Sayers, Managing Director, ESB Networks

And staying with mass EV roll-out, Ms Sayers outlines the separate SUCCESS project which concentrates on the potential cyber risks posed by the public charging network and how the network can remain secure.

A wave of world-class companies have located to Ireland with the confidence that the electricity infrastructure will meet their needs. This has enabled Ireland to become a world leader in industry and technology, transforming beyond recognition the rural, agrarian society of 70 years ago.

"As we look to a low carbon future powered by a smart electricity grid, we continue to serve our 2.3 million industrial, commercial and domestic electricity customers with pride," Ms Sayers concludes.

The quiet revolution continues.

Contact details:
www.esbnetworks.ie

Mas²tering

(Em)powering local flexibility aggregation

The European project entitled "Mas2tering" exploits the Multi-Agent System (MAS) paradigm of Artificial Intelligence in the context of low-voltage (LV) power grids for residential customers to develop technologies that will empower cyber-secure active demand response (DR) in domestic and small-scale commercial applications. Mas²tering is an acronym that stands for "***M**ulti-**a**gent **s**ystems and **s**ecured coupling of **te**lecom and **e**n**er**gy g**ri**ds for **n**ext **g**eneration smart grid services.*"

MOTIVATION & APPROACH

Evidence suggests that residential flexibility will dominate EU demand response potential by 2030[1] – but is (as of today) the least utilized and least available source of flexibility due to its decentralized nature, technological and regulatory barriers, which in turn provide the motivation to empower consumers to act, make smart home and networks a reality and to ensure data protection and participation in fair and transparent market-based offers. If the potential of residential flexibility can be unlocked then some of the concerns about electrification, renewables and grid reliability would be addressed while simultaneously increasing consumer choice opening new business collaboration opportunities. As such, Mas²tering enables consumers and prosumers alike with smart devices to participate in sharing electricity within the local community (low-voltage grid) through small to large flexibility aggregators – all powered up by a set of business models, developed in close collaboration with key industry stakeholders.

INTEGRATED TECHNOLOGIES BEING DEVELOPED BY MAS²TERING, KNOWN AS THE "MAS PLATFORM"

- Energy Boxes of Telecom Italia S.p.A for connecting home smart appliances with the smart meter and acting as gateway to the rest of the grid
- MAS optimization framework for algorithms that enable decentralized flexibility management, developed by The French Alternative Energies and Atomic Energy Commission (CEA)
- Real-time weather, energy generation and load forecasting for individual houses to LV grid developed by Cardiff University
- Early warning system for cyber security monitoring, developed by Airbus Cybersecurity

Deliberate and cutting edge, a MAS approach means that decisions are taken by "agents," e.g. the devices themselves in a cost-effective manner using optimization algorithms. A MAS Platform is then used to coordinate the DR actions of the agents in its domain.

1 "Impact Assessment Study On Downstream Flexibility, Price Flexibility, Demand Response & Smart Metering – Final Report", EU Commission DG Energy, July 2016

INNOVATIVE BUSINESS MODELS FOR DEPLOYMENT OF THE MAS PLATFORM AND PROSUMER COMMUNITIES

To utilize the MAS Platform and make it a viable business opportunity, local aggregators will manage the flexibility provided by prosumers belonging to the same community, enabling local LV flexibility management and in turn supporting higher-voltage (industrial) grid-connected parties by softening peaks & troughs. This local aggregator employs a multi-sided business model connecting prosumers, energy retailers and distribution system operators (DSOs) in the LV grid. Early adopters of this disruptive business model are likely to be incumbent utilities and/or telecoms competing for customer base retention or acquisition. Moreover, the MAS Platform and its associated business models allow existing energy aggregators to extend their existing (industrial/commercial) flexibility portfolios "down" to the residential level.

INITIAL RESULTS OF MAS²TERING AND NEXT STEPS FOR MAS PLATFORM COMMERCIALIZATION

- Local balancing saves up to 10% of LV grid losses and supports deferral of investment for grid reinforcement
- Prosumers can save up to 30% of their energy cost (as a function of available flexibility)
- The solution allows up to 20% higher renewable hosting capacity of the grid
- Local optimization of flexibility can be easily integrated into existing energy market mechanisms

What's next? Mas2tering has focused on a restricted part of the grid and on planning and validating the optimal use of local flexibility with a market mechanism compatible with day-ahead and intraday energy markets. Next steps are to extend the MAS Platform capabilities to the operational phase (close to real time) and to integrate it into larger portions of the grid.

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This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 619682

Europe must show the way on climate action

Clouds are gathering on the international climate agenda.

Kristian Ruby (pictured), Secretary General, EURELECTRIC

President Trump has decided to pull out of the Paris agreement, but no matter the decisions of the US, Europe vows to keep fighting global warming."

NO NEW COAL PLANTS IN THE EU AFTER 2020

The European electricity sector strongly supports an ambitious climate policy, both globally and in the EU.

Through EURELECTRIC, which represents more than 3500 companies across Europe, the sector already committed in 2009 to a fully CO_2-neutral power supply by mid century.

Last year, the sector encouraged EU decision makers to accelerate CO_2 reductions through a comprehensive reform of the EU ETS.

And last month we sent a very clear signal to the international markets: From 2020, no new coal power plants should be built in Europe.

CO_2 REDUCTIONS THROUGH ELECTRIFICATION

The transformation of the electricity sector must go hand in hand with electrification of other economic sectors. In industry as well as heating, electricity can help reduce CO_2 emissions.

And of course in the transport sector, where the shift from petrol to power gives a clear climate benefit already today.

Based on the EU average electricity mix, an electric car today only emits 50 grams per kilometer - a fraction of what petrol cars emit.

POLITICAL DRIVE FOR CHARGING INFRASTRUCTURE

In the Clean Energy Package, which is currently being discussed in the European Parliament and the Council, there are a number of handles to ensure increased use of electricity in other sectors.

For instance proposals to ensure the necessary charging infrastructure for electric cars through minimum requirements for buildings relating to precabling and number of charging points.

These proposals currently face opposition in the Council of Ministers. Of course, they will require investments on the short run. But they are absolutely crucial when it comes to preparing our cities for a future where electric cars are the rule, not the exception. So it is important that we don't drop the infrastructure investments on the basis of short-term economic arguments.

SIGNAL TO CAR MANUFACTURERS

Infrastructure is key. But it will not do the trick alone. In addition to incentives to drive sales already today, there is a need for clear signals to automakers to speed up innovation.

EURELECTRIC advocates ambitious CO_2 emission targets for cars, specific targets for zero emission vehicles as well as a service check of the emission test cycle, which currently does not account properly for the actual emissions of cars.

The debate on the transformation of the transport sector will be on the political agenda in Brussels in 2017, where the Commission plans two major transport initiatives.

EURELECTRIC will advocate an ambitious approach. In a time where the European project is facing criticism on many fronts, new steps to boost industrial innovation and climate action would be a powerful way to prove the value of our cooperation.

The importance of integrating energy and urban planning now

By Waltraud Schmid, Energy Center Wien, TINA Vienna

Many cities grow considerably and face enormous pressure to provide new homes, jobs and infrastructure. Annual population growth rates of 1.5-2.5% mean that in bigger cities areas the size towns of 30.000 inhabitants have to be built or refurbished each year. All these new buildings and infrastructure impact the energy and CO_2 performance of 2050 and thus should already contribute to long-term decarbonisation as committed to in the Paris Agreement. But short-term investment decisions widely favour natural gas as heat supply.

Ambitious large-scale urban developments such as Stockholm Royal Seaport, Vienna Aspern Seestadt, Berlin Adlerhorst or Paris Clichy-Batignolles show the direction. Their common lesson: the more ambitious the development projects, the more important is it to plan and develop projects in an integrated manner – infrastructure, energy and mobility – and to include energy supply considerations at an early stage. But public authorities' competences for long-term energy planning got locally often lost with the liberalisation of the energy markets in the EU.

With the URBAN LEARNING project, the cities of Amsterdam, Berlin, Paris, Stockholm, Vienna, Warsaw, Zaanstad and Zagreb joined forces to raise the profile for long-term energy planning in their cities and beyond. Furthermore, they work towards integrating energy planning and urban planning and to share their ways forward with other cities. Co-funded by the EU's Horizon 2020 programme, it's focus is on the governance for planning and development of urban quarters and sites in cities. Why?

NEW LOW CARBON SUPPLY OPTIONS

Technological, economic and regulatory changes make more low-carbon solutions possible. Also, in a few years from now, nearly zero-energy buildings will become the standard. They will need considerably less energy, might even produce energy. This will offer new possibilities to supply city quarters with decentralised energy options, using on-site renewable energies or low-exergy district heating & cooling grids, etc. Electricity will generally gain importance and - with the expected shift to e-mobility – will bring energy and mobility issues close together. Differences in availability of on-site renewables are also a spatial dimension.

GRID OR NO GRID IS THE QUESTION FOR PLANNING

Supplying a single building with energy is not an urban planning issue. But in dense urban areas, grid-connected energy supply options are common and those require public planning for economic reasons and because it concerns public space and infrastructure. Thus possible energy supply alternatives need to be discussed at a very early planning stage to decide if and what kind of grid-connected energy infrastructure should be foreseen. Again there is a spatial dimension to energy planning.

THE URBAN LEARNING AGENDA

In the participating cities bits and pieces towards integration of energy and urban planning exist already though not yet incorporated into the standard governance processes. URBAN LEARNING offers the external stimulus to dedicate time and resources in each city and across the participating cities to analyse

Vienna's large urban development project 'Vienna Lakeside aspern'

- the planning processes,
- the framework conditions,
- the involved actors as well as
- the instruments and tools, and
- possible forms of low-carbon energy systems and their planning implications

and to come up with proposals for a better integration of energy and urban planning processes.

INTERDEPARTMENTAL GROUPS AS BACKBONE

All cities initiated a local working group with staff members from various city departments involved in urban and/or energy planning and housing. Some groups also include external stakeholders, e.g. distribution network operators or developers. These groups supported the analyses of the governance processes and contribute to their further development.

Across all cities these working groups underline the value of interdepartmental exchange and cooperation when planning the development of urban areas. They also surfaced a clear need for more knowledge on energy issues in planning departments and overall created a sound work basis through debating and learning together.

DEFICITS OF CURRENT GOVERNANCE PRACTICES

The analysis shows that

- energy aspects are generally well addressed at the level of a building (energy demand, share of renewables) but largely lacking at the level of housing or business park developments, quarters or districts;
- qualities requested at early urban planning stages are often lost in subsequent planning and construction phases;
- a number of good practices in terms of instruments or tools for planning exist in the cities, which inspired each others work when investigating ways forward.

For this analysis the exchanges between the cities – peer to peer – proved to be extremely valuable. They also sharpened the understanding of one's own situation. Across the cities the analysis showed similarities in the principle levels and stages of urban planning – from the strategic planning down to the building regulation plan as well as in the principle elements of the urban planning processes. Equally it surfaced a lot of differences, particularly in the framework for energy and urban planning as well as in the cities' land policy. This underlined the importance of the legal/political context and (planning) cultures and the importance of understanding those aspects well for coming up with suitable proposals for upgrading the relevant planning processes.

LACK OF SUPPORTING FRAMEWORK CONDITIONS

Our discussions why something is possible or not possible in a city often ended at the fostering or hindering framework conditions – be it legally, strategically or organisationally.

For considering energy aspects as part of urban planning processes, the legal base for urban planning has to include energy or climate protection objectives as reason for spatial differentiation, as e.g. in Germany. Alternatively, energy transitions laws such as in France now demand energy planning for dense territories and require the integration of energy planning through new legal acts.

Furthermore, it turned out to be important to have clear overarching long-term low carbon strategies in place, which then also guide urban development and planning.

Another factor which was identified as decisive was to have clearly spelled out responsibilities and resources for energy planning in the city.

THE WAY TO INTEGRATIVE ENERGY PLANNING

Based on the own analysis and the inputs from the other cities, in each city priorities for integrating energy and urban planning were identified and put together – from supporting framework conditions, necessary actors to proposals for where and how throughout the urban planning processes energy aspects could become a part, as e.g. when selling or renting land, in urban contracts, when controlling obligations.

JOIN IN

Overall URBAN LEARNING succeeds to be the door opener for bringing energy planning (back) on the urban/spatial planning agenda in the involved cities. This is needed in many European cities and legislation, e.g. in France, starts to respond. Already during the project, we have established an "inner circle" of about 15 cities in the involved countries with whom we team up for in-depth mutual learning on the topic.

Our selection of cities, with differences in climatic, economic and social conditions, make the results relevant and replicable for many, also smaller, European cities. Besides many national dissemination activities of the cities, a final event mid-October 2017 in Vienna will offer ample opportunities for "urban learning" from the participating cities and beyond, and to advocate for integrating energy planning as key instrument towards decarbonisation at local level.

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URBAN LEARNING

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Let's not put high performance servers into a permanent idle state!

By Cecilia Bonefeld-Dahl, Director General DIGITALEUROPE

Plans for an Ecodesign measure to increase the energy efficiency of servers risk side-lining the very servers that will further reduce energy consumption in the future.

While DIGITALEUROPE fully supports the European Commission's efforts to address energy consumption, its proposal to limit "idle state" power consumption may lead to the risk of an increase of at least 10% in energy consumption in data centres and possibly even see power usage rise by a third. This would run counter to recent trends driven by market forces, which research[1] shows as low or flat, despite exponential growth in data processing.

How is the digital industry sector achieving such consistent energy stewardship? Each new generation of servers performs better in relation to power consumption, through greater virtualization and more advanced operating parameters as they host, maintain, share and analyse data. In addition, the propagation of cooling best practices in legacy data centres as well as the consolidation of operations into new, more efficient locations is a major contributor to managing energy demand.

COMPUTING IS COMING OUT OF THE CLOSET

However, most important is the shift away from local servers to the cloud. Fewer SMEs rely on their own 'box' in remote "data closets" or their offices, which typically remain non-active for substantial periods of time. In today's IT environments, workloads can increasingly be virtualized and combined on a smaller number of servers, which are almost permanently active. If low-usage servers are a thing of the past, then so should be the focus on idle-state power consumption.

Idle power is the energy consumption of a device when it is in a non-active state waiting for the next work request to arrive. In the past waiting would typically represent a large proportion of a server's up time, so yesterday's models were designed to consume as little power as possible during these periods. Nowadays, servers are rarely not being solicited or accomplishing demanding tasks in the background between assignments and are designed in accordance.

Regulating "idle mode power" would be counterproductive as the limits proposed by the Commission inevitably favour lower power servers and exclude modern higher performance models. Higher performance means

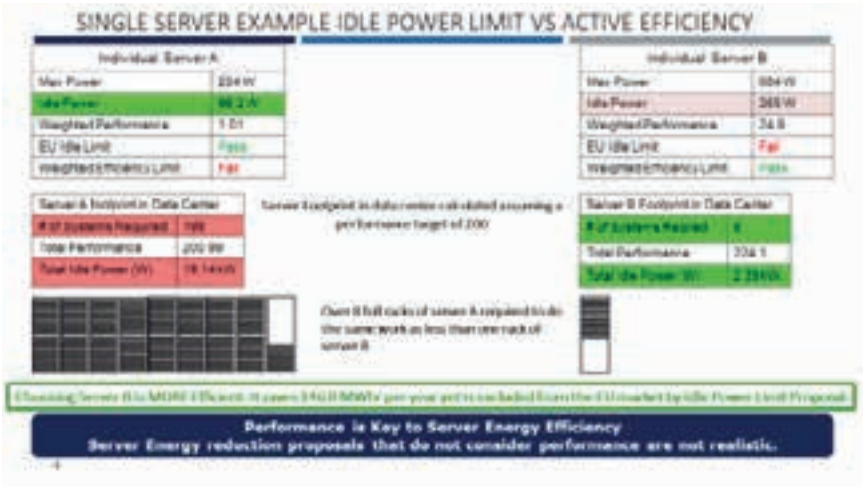
higher power efficiency: despite using more energy, the workload capacity of today's models so far outstrips that of their predecessors that the ratio of throughput to power usage is indisputably in their favour. Removing the option of higher efficiency servers would result in a net increase of server power consumption.

The figure opposite illustrates how unintended consequences can impact the sheer number of physical products required and the subsequent increase in energy consumed. Only nine high performance servers are necessary to deliver a defined workload as compared to 199 lower performance low idling servers. This representative illustration shows the negative impact on energy consumed, high performance servers would use just 12.5% of the TOTAL idle power consumed if using the "low Idle Power" configuration.

DIGITALEUROPE maintains that server efficiency is best assessed through the use of a performance based SERT weighted geomean efficiency metric, a method which determines the overall performance per watt of servers delivering a specified workload in a data centre. The metric was developed using an extensive dataset to assess and validate its effectiveness and it reflects a consensus among DIGITALEUROPE's members of how to remove the least efficient servers from the market.

THE POTENTIAL SAVINGS

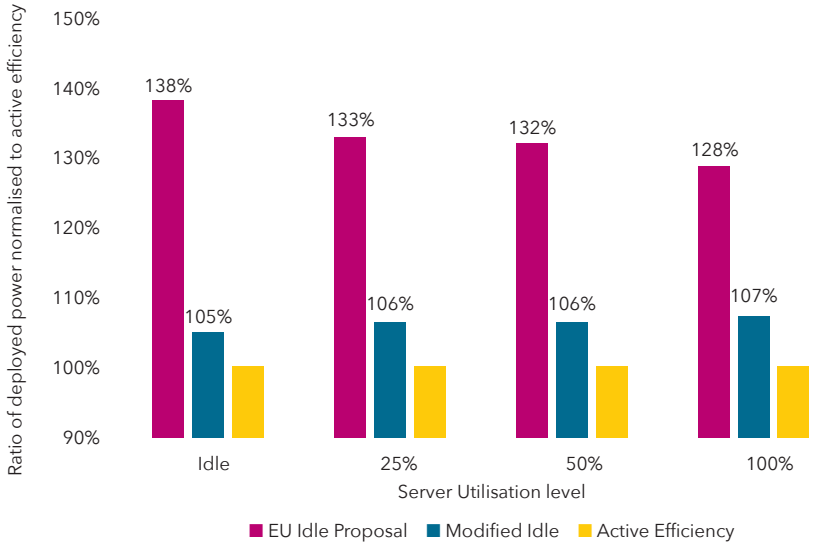
The Commission has projected that the energy consumption by servers will be 46TWh by 2030, and with the current proposal including an idle limit, that



there will be a direct energy savings of 2.4TWh and an indirect savings of 3.7 TWh via data centre infrastructure such as cooling equipment. DIGITALEUROPE projects that the savings using server active efficiency will result in a total power savings of 23.1TWh (14.4 directly by servers and 8.7 through infrastructure), which is a significantly higher savings potential. The CO_2 savings, as well as the financial savings for data centre operators will be along the same order of magnitude.

DIGITALEUROPE encourages the European Commission to recognise the risk of imposing a counterproductive efficiency measure based on a server idle power limit and work with us on maintaining the trend towards delivering efficient energy consumption in data centres.

Ratio of Data Centre Deployed Power using average of systems passing respective proposals with Active Efficiency as baseline



1 Malmodin, J., Lundén, D. (2016). The energy and carbon footprint of the ICT and E&M sector in Sweden 1990-2015 and beyond. Paper published and presented at: ICT for Sustainability (ICT4S), Amsterdam, Netherlands, 30–31 August 2016. Shehabi, Arman, et al. 2016. United States Data Center Energy Usage Report. Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-1005775. June 27.
http://www.datacenterknowledge.com/archives/2016/06/27/heres-how-much-energy-all-us-data-centers-consume/

ZEROCO2
Interreg Europe

From near zero energy to zero CO_2 emission building

At the start of this decade, carbon emissions and energy consumption increased faster, as was predicted by the Roman club in their expertise Beyond the limits in 1992. It is well known, that the buildings sector in the EU consumes more than 40 % of total energy use. This problem became a priority at the EU Commission with the adoption of the Directive 2012 / 27 / & Directive 2010 / 31 Energy Performance of Buildings and Energy Efficiency. At present, across most of the EU, the political will for such action to enhance energy efficiency in buildings, and integrating renewable energies appears to be diverse. The EU Directive proposes that after 2020 all new buildings must be (near) zero energy as well as near zero CO_2 emission buildings on energy use (NZCO2EB). Although there has been much recent focus on measures to reduce emissions from new buildings, the existing building stock remains largely untouched and many refurbishment projects miss opportunities to reduce emissions and deliver low CO_2 buildings. Knowledge of how to build new excellent energy-efficient buildings, and how to refurbish existing buildings to achieve greater improvements in energy efficiency & CO_2 reduction, is already in place. It often makes economic sense, like any innovation once volume is increased, costs will decrease. There are demonstrations of what is possible, but many barriers to widespread mainstream effective action remain. The Energy Roadmap 2050 is encouraging, but it is long-term strategy. Accelerated action is necessary before 2020, hence the need for policy adoption in the regions of ZEROCO2, which show what is possible. There exist many new innovative concepts, such as passive house, net metering, smart grid etc. There are many innovative standards across the EU28, but for the purpose of this part of the project, ZEROCO2 is showing that codes are evolving. Adopting passive house or a similar quality as the standard for both new build and the refurbishment of existing buildings will bring many benefits, some of which are outlined in this paper. There are many policies and technologies which lead to the near zero CO_2 and near zero energy buildings. This is shown in recent research which indicates that over 70 per cent of global energy use could be saved by practically achievable design. Partners form 8 member states within the project "ZEROCO2 Promotion of near zero CO_2 emission buildings due to energy use", have finished the overview of the national, regional as well as local policies in this field. The findings were gathered by the Regional Policy Reports and published in one document- Common study.

The overview of the Regional Policiy Reports underlines that the idea behind the reduction of energy coming from fossil sources often has, as its starting point, the increased production of energy from renewable sources. In essence it should also focus on the concept of reducing energy consumption, by working on the technical and system characteristics of the buildings, which account for about 40 % of the gross final consumption of energy. As member states have different climates and RES availability, it is also reflected in their energy policies. In EU regions, where solar radiation is stronger and more consistent and where the seasonal temperatures are higher (e.g. Italy, France, Greece, Malta), the requirement is for active heating and cooling by optimising passive design. In EU region where the climate is harsher and where exposure to light and solar heat is reduced (e.g. Slovenia, Finland, Germany, Lithuania)it is preferable to use higher efficiency systems and equipment as well as biomass as a primary energy source.

Many demonstration sites show that near zero energy and CO_2 buildings already exist. In one case of an existing public building, a rough analysis of the opportunities to achieve near zero energy has been produced. The building, built in 1975, with a prefabricated construction system of a net area of 365 m^2 has 10 cm mineral wool thermal insulation with salonite façade panels and plaster. The wooden ceiling was covered with gypsum cardboard panels and 15 cm thermal insulation. The building has been energy renovated except for the heating system. Two possible scenarios have been developed to achieve near zero CO_2 as a result of energy use: 1) biomass boiler and photovoltaics, 2) Heat pump and photovoltaics (see Table below).

Table: Evaluated scenarios toward near zero CO2 building.

	Building-current status	Building - NZCO2EB measures Scenario 1	Building - NZCO2EB measures Scenario 2
Energy need for heating kWh/a	21.578	21.798	21.997
Energy need for cooling kWh/a	1.352	1.355	1.352
Use of electricity kWh/a	8.945	8.945 9.090 (produced)	17.436 18.200 (produced)
CO2 emissions kg/a	9.056	4.741 (without PH) 0 (with PH)	9.241 (without PH) 0 (with PH)
Operating costs per year (EUR/a) (heating and electricity)	2.800	1.060	0

As shown on the table it is evident that the both scenarios lead toward zero CO2, but scenario 1 has higher operating costs because of the use of biomass meaning that, from the operating point of view, the scenario 2 is more suitable for implementation without considering investment costs.

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Interreg Europe
European Union | European Regional Development Fund

ELECTRA: Steam + el = H_2

The ELECTRA project[1] of the FCH JU – taking proton ceramic electrolysers (PCEs) from button-cell to pressurised tubular stack level – is concluding in 2017. ELECTRA has developed PCEs based on proton conducting barium zirconate as electrolyte. Like solid-oxide electrolysers (SOEs) they utilise available heat or steam from waste or renewable geothermal or solarthermal sources to increase the electrical efficiency. PCEs operate at intermediately high temperatures – up to 700°C – and unlike SOEs they produce directly dry pressurised hydrogen and oxygen diluted with steam. Hence the hydrogen is produced at the total pressure of the unit in a simpler, more efficient, and safer process than competing electrolysers.

The project and its partners have developed materials and procedures for production of segmented tubular cells, involving extrusion, co-sintering and novel sealing technologies. Novel oxygen+steam-side electrode materials with good electrocatalytic properties and stability in steam have been applied on tubular segments to yield unprecedented currents and hydrogen fluxes in PCEs. A multi-tubular high pressure module with capability to monitor and replace individual tubes has been designed, built, and tested. The balance of plant and techno-economics of the integration of PCEs with various sources of electricity and heat or steam have been modelled. Mass-produced PCEs may be inexpensive and will, with available heat or steam, produce hydrogen competitive to e.g. alkaline electrolysis.

The project has also tested and modelled co-electrolysis of CO_2 and steam. In so-called co-ionic mode using both proton and oxide ion conduction, it produces syngas at a CO:H_2 ratio of 1:2, variable by varying the materials and conditions.

Prof. Truls Norby at University of Oslo (UiO) has led a team consisting of institutes SINTEF (NO) and ITQ/CSIC (ES), SMEs Carbon Recycling International (IS) and Marion Technology (FR), and industries Abengoa Hidrógeno (ES) and CoorsTek Membrane Sciences (NO). The project has run from 2014 to 2017. Partners are now pursuing PCE technology of multi-module units of 10 kW and above to deliver hydrogen at 30-50 bar – serving industries with competitive hydrogen where heat/steam and peak/renewable electricity are available.

1) High temperature electrolyser with novel proton ceramic tubular modules of superior efficiency, robustness, and lifetime economy, FCH JU Grant agreement 621244, 2014-2017.

Coordinator Prof. Truls Norby to the right, with some of the project team members during the final meeting at ITQ/CSIC in Valencia, May 2017, around the ELECTRA 18-tube 1 kW 20 bar proton ceramic electrolyser.

The innovation challenge: will the EU be able to scale up the rate of energy renovation to meet its climate commitments?

By Roberta D'Angiolella, Buildings Performance Institute Europe (BPIE)

In November 2016, the 194 signatories of the Paris Agreement pledged to limit global warming to below 2°C, challenging the European economy to accelerate its energy transition. With the appropriate support and introducing innovations in the construction value chain, buildings could indeed play a leading role in transforming the EU energy system, increasing the speed with which the three biggest CO_2 polluters – the buildings, transport and power sectors – are reducing their climate impact.

INNOVATION IN THE CONSTRUCTION INDUSTRY

The European construction industry and its economy are undergoing a rapid and fundamental change, shaped by megatrends such as greater urbanisation, disruptive new technologies and digitalization. New construction methods, energy monitoring and optimisation tools as well as other technologies such as batteries, Photovoltaics (PV) or smart charging for Electric Vehicles (EV) are multiplying.

Despite this progress, the construction industry could still do more in terms of innovation, which has the potential to boost extensive building improvement work, substantially increasing energy efficiency and reducing energy consumption by 75% or more.

Figure 1: Charging stations for Electric Vehicles gaining ground in many cities. Source Flickr-Retinafunk

Figure 2: Many systems and applications allowing to manage energy at home. Source: Danfoss

Ramping up deep energy renovation can boost the economy (competitiveness and jobs), improve living conditions (better and smarter homes, increased indoor comfort and air quality) and mitigate climate change. In other words, innovation in all aspects of the renovation process – products, services, business models and policy – offers great opportunities.

TECHNICAL SOLUTIONS AND PRODUCTS

Innovation in technical solutions and construction products is one of the critical elements to speed up the pace of deep energy renovation. Enabling the transition towards a full interaction of buildings with the energy system means considering all the products and services that allow not only reduced energy consumption and renewable production, but also smart and flexible consumption.

Examples of these technologies and systems are energy storage, smart control systems, EV charging points and demand-side flexibility, where the user can have a more proactive role. When developing a new service or product, it is indeed critical to consider the requirements of the projected end-use, such as comfort level, work performance, flexible use of space, or entertainment possibilities.

Many innovative projects and solutions to scale up deep energy renovations are being deployed across Europe. Two examples are the KfW case for PV home-storage solutions in Germany and the EU-funded project CommON*Energy*.

KFW PUSH FOR PV HOME-STORAGE SOLUTIONS IN GERMANY

The German government offers a 30%-investment-grant on equipment purchased with low-interest loans provided by the German State-owned development bank KfW. The scheme has helped boost the residential energy storage market from almost zero installations two years ago to around 1,000 per month. By the end of 2015, around 35,000 households and commercial operations in Germany had invested in a PV-battery system.

THE COMMON*ENERGY* PROJECT

The EU-funded project CommON*Energy* is another best case to demonstrate the benefits coming from the development of innovative technologies. The project aim is to re-conceptualize shopping centres through deep retrofitting. The innovation lies in the development of a systemic approach made of 25 new technologies and solution-sets (implemented in 4 demo cases) as well as methods and tools to assess their environmental and social impact.

Solutions to improve the harvesting of natural sources for shopping centres' envelope were studied, while introducing new functions for reducing the energy demand of the whole building. For example, greenery in building envelope and multifunctional smart coating materials with reflectance properties, thermal behaviour and anti-moulding/ antibacterial activity were studied and integrated. To make the lighting system more sustainable, innovative light domes using the passage of sunlight through solar tubes were also deployed.

With its innovative approach, CommON*Energy* helped making big steps forward in the renovation of shopping centres, previously perceived as icons of a consumerist society. The success of the newly-developed technologies is shown by analysis of the renovation projects in three European countries: Italy, Spain and Norway.

COLLABORATION AND POLICY MEASURES AS KEY TO SPUR INNOVATION

Despite good progress at small scale, Europe is not entirely ready to take advantage of the benefits a full energy transition scaling up the rate of renovation could bring. To create a fertile ground for the development of innovative solutions and technologies, an enabling environment must be ensured. This can be possible, for example, through strong collaboration between industry actors and local governments, this way speeding up the development of innovative projects.

Demand for renovations can also be created by ensuring a set of innovative policy and support measures. At the end of 2016, the European Commission released important pieces of European

Figures 3 and 4 – Solar tubes in the shopping centre "Modena Canaletto", bringing direct sunlight inside the shop. Source: CommONEnergy, http://commonenergyproject.eu/

energy legislation in the "Clean Energy for All Europeans" package, covering energy efficiency, renewable energy, the electricity market, consumers and governance rules for the Energy Union. The package offers a great opportunity to put in place this kind of new solutions, such as private and public one-stop shops and individual building renovation passports. Understanding the perspectives and experiences of building users and the awareness-raising coming from their larger involvement are indeed key to creating demand for deep renovations.

Creating a good setting for the development of new innovative solutions would therefore mean speeding up the renovation process.

Our buildings are the biggest infrastructure investment we have and they are still one of the three biggest CO_2 polluters. It is critical to make this infrastructure future-proof by transforming the building stock and by ensuring that new and old buildings are energy efficient and smart. Current innovative technologies and solutions prove that speeding up renovation rate is possible. This would mean benefits for Europe's innovation and technology leadership, its economy and its citizens who will gain healthier and better places to live and work.

For more information on BPIE's work visit **www.bpie.eu**

LOCARBO Project

Novel roles of regional and LOcal authorities in supporting energy consumers' behaviour change towards a low CARBOn economy

LOCARBO Project – Novel roles of regional and LOcal authorities in supporting energy consumers' behaviour change towards a low CARBOn economy

LOCARBO project aims at improving policy instruments targeting demand driven initiatives to increase energy efficiency related to the built environment. This will be achieved by finding innovative ways for regional/local authorities to support energy consumers' behavior change.

The 7 project partners from Hungary, Italy, Lithuania, Portugal, Romania and the UK are aware that regional policies on energy efficiency can only be successful if pieces of the puzzle are brought together. Therefore, over the upcoming four years, LOCARBO will focus its activities on bottom-up initiatives on 3 thematic pillars (supplementary services and products offered by authorities, innovative cooperation models, and innovative technological solutions) in a fully integrated way.

LOCARBO will combine and roll-out innovative practices linked to three strongly interrelated thematic pillars:

- Supplementary services and products: Services and products offered by regional and local authorities, such as energy consultancy services to end users and energy ambassadors.
- Innovative cooperation models: Cooperation models based on Local Energy Communities, composed of economic and civil actors cooperating on energy efficiency and renewable energy, oriented to foster an active involvement of stakeholders, especially energy consumers.
- Innovative and smart/ICT technologies: Supporting the spread of intelligent technologies, such as energy management systems and smart meters in regions/ countries with lower penetration rates, and systematically collecting and analysing data and feedback information in order to support evidence-based policy making.

Among the activities:

- Each partner region has to produce a regional/local analysis related to the addressed policy instrument, integrating the state-of-the-art and the ambitions of the region.
- Each partner region has to develop a regional/local action plan with a view to improve the tackled policy instrument associated with Structural Funds and other programmes, influencing EUR 100 M of funds.
- Local living labs: Each partner has to involve local/ regional stakeholders in the project, namely in the elaboration of the local/regional action plans and in the networking activities.

The main result of LOCARBO is the improvement of the tackled policy instruments associated with Structural Funds and other programmes, centred on energy efficiency and the use of renewables in buildings and on the change of energy consumers' behaviour.

LOCARBO
Interreg Europe

THE PARTNERSHIP
Province of Potenza (IT) – Lead Partner
Basilicata Region (IT)
Municipality of Vila Nova de Gaia (PT)
Durham County Council (UK)
Kaunas University of Technology (LT)
Hungarian Innovation and Efficiency Nonprofit Ltd (HU)
Municipality of Alba Iulia (RO)
Budget: €. 1,608,670.00
Duration: from 1 April 2016 to 30 September 2020

Unleashing the value of energy storage

"Transmission lines bring electricity from A to B, but storage will bring it from today to tomorrow"

By Joint Research Centre Press Office

Energy storage has been part of the energy system for decades, but it is with the emergence of new storage technologies and the need to integrate more renewable energy sources into the power system that the sector is faced with new challenges – and opportunities. Research and technological development and innovation are needed to anticipate future trends and to enable the wider application of energy storage technologies. Scientists at the European Commission's Joint Research Centre (JRC) are determined to support these developments to facilitate the transition towards a low-carbon energy system.

The share of renewable energy in the European electricity sector is expected to increase from 27% today to close to 50% in 2030. Large quantities of renewable energy of fluctuating and intermittent nature – like wind and solar power – will need to be produced if Europe is to reach its energy and climate commitments.

Energy storage presents one of the solutions to managing the excess energy, making it possible to store electricity during low electricity

Battery Energy Storage Testing for Safe Electric Transport: The battery testing facilities test the performance and safety of the batteries of electric vehicles.

Smart Grids Interoperability Laboratories: The Smart Grids Interoperability Laboratories at JRC Ispra and Petten support the development of the EU policies by testing of the interoperability of the devices and systems that are part of the power grid.

demand and release it back into the grid during high demand. Energy storage can also contribute to stabilising the electricity grid, making it possible to ensure sufficient and reliable supply while increasingly reliability on variable renewable sources.

In the future, energy storage is expected to play a key role in improving the security and efficiency of electricity supply and in enabling the EU to develop a low-carbon electricity system by facilitating the market introduction of renewables.

UNDERSTANDING FUTURE STORAGE NEEDS

New energy production patterns change the requirements for storage facilities. At the same time, these changes open up new opportunities for energy storage use by contributing to decarbonisation in the industry and transport sectors.

Scientists at the Joint Research Centre (JRC) study the operations of advanced energy systems and technologies to understand future needs for flexibility and storage. The JRC is using modelling techniques to assess different aspects of the power grid, from individual storage units used by households to the long-term developments within the entire energy system.

The JRC has developed a chain of models to assess future storage needs. At one end of this chain, a collection of models is used to simulate the operation of centralised and decentralised power storage in the market context. At the other end, an energy system model is used to study long term energy pathways within the entire energy system. With this model, JRC scientists can determine the required investments in energy technologies in Europe over the next five decades.

"All short term and long term operations need to be taken into consideration to understand the future role of storage. In the context of decentralised power storage, we have observed a growing number of households that use battery storage to complement already installed PV panels. The question arises whether these self-producers will gradually become fully self-sufficient and disconnect themselves from the general power grid. Using different models, we have been able to show that these 'prosumers' are unlikely to disconnect from the grid but that they will underutilize it in the future", explains Andreas Zucker, leader of the power system and market modelling project at the JRC.

Using these models, JRC scientists have also demonstrated that more ambitious CO_2 reduction targets with higher shares of renewable energy would trigger the investment into storage facilities.

HYDROGEN FROM RENEWABLES LINKS THE ELECTRICITY SYSTEM WITH TRANSPORT, RESIDENTIAL AND INDUSTRIAL SECTORS

Hydrogen is not a primary energy source such as coal or gas but an energy carrier, similar to electricity. Its capacity to store and deliver energy in widely useable forms makes it one of the most promising alternative fuels for future transport applications.

Hydrogen produced from excess renewable electricity can bridge the electricity system with the transport and industrial sectors and contribute to their decarbonisation.

When produced from renewable sources, hydrogen provides pollution and CO_2 free energy for all end-use applications. The "Power-to-Gas" concept refers to the process of converting surplus renewable energy into hydrogen gas. Combined with the greenhouse gas CO_2, renewable hydrogen can be used to produce methane, which can be injected, stored and distributed in the natural gas network.

Significant development is still needed before hydrogen can be exploited in the same way as conventional fossil fuels. The storage and distribution of hydrogen is challenging due to its low volumetric energy density. It is associated with hazards that must be properly addressed to ensure its safe distribution, storage and use.

In order to come up with solutions to these challenges, JRC scientists, engineers, computer modellers and technical staff perform pre-normative research for the development and improvement of hydrogen storage, safety and detection. They are tasked with testing high pressure vehicle tanks, storage materials and hydrogen sensors to measure their safety and performance.

"The conversion of excess electricity to hydrogen can help facilitate the integration of large shares of intermittent renewable sources into energy grids. In addition to reducing the need for curtailment of renewable electricity generation, power-to-hydrogen contributes to enhanced energy security through interlinking of the energy,

transport and industry sectors. Hydrogen can enable long term storage of energy in underground caverns. It can be used as a fuel or feedstock, or converted into chemicals for industrial use", said Marc Steen, Senior Expert in energy storage at the JRC.

With its pre-normative research, the JRC aims to enable the commercialisation of hydrogen in a number of technologies and applications. The research outputs feed into fit-for-purpose performance-based European and international standards and regulations for hydrogen storage, detection and safety.

HOW FAR CAN I DRIVE BEFORE THE BATTERY RUNS OUT?

The use of rechargeable battery technologies for energy storage in utility-scale applications is a rapidly developing area, but also the electric vehicle industry is heavily dependent on safe and high performance batteries.

Anticipating the growing need for robust and impartial research on rechargeable energy storage systems, the JRC has established state of the art experimental facilities in Petten dedicated to batteries. The facilities are used to evaluate the safety and performance of batteries as well as emerging battery materials, their ageing and performance degradation. The research is done in collaboration with European industry representatives and with trusted international partners.

"We test electric vehicle battery materials, cells, modules and packs to support technology innovation and international e-mobility safety legislation. Our facilities are equipped with thermal, electrical, mechanical and analytical experimental facilities, so that we can look at battery performance and safety under a range of simulated environmental conditions", explains Lois Boon-Brett, project leader working in the Energy Storage Unit.

ENERGY STORAGE TECHNOLOGIES ENABLE SMART GRIDS

The smart grid offers many advantages in terms of sustainability, increased energy efficiency and enhanced energy security. Smart grids can help integrate more renewables in the energy system, accommodate electric vehicles, give more control to consumers over their energy consumption, avoid blackouts and restore power quickly when outages occur.

Energy storage is a key element for the success of smart grids. Storage offers flexibility in the demand and supply phases and contributes to the resilience and adequacy of the system.

At the JRC, scientists have created models to simulate the future prospects of low-carbon technologies and energy storage options. On the basis of these models, they are able to analyse the interaction between policies, economics, resources, infrastructures and the market uptake of these technologies.

"We have created very detailed models of the European power system, covering the continental scale (EU Member States and beyond), the regional scale (e.g. Baltics, Cyprus) and the local scale (e.g. distribution grids for smart cities and rural electrification). These models are used to perform analyses supporting policies on energy security, Projects of Common Interest, generation adequacy, renewable energy and demand response integration at the EU, national and local level", explains Gianluca Fulli, Deputy Head of the Energy Security, Distribution and Markets Unit at the JRC.

The JRC's research findings support the work of the European Commission and feed into the policies and decision-making at EU level. Ultimately, the JRC's pre-normative research supports the deployment of energy storage technologies to achieve the European Union policy goals pertaining to transitioning to a low-carbon, safe, secure and sustainable EU overall energy system.

The Strategic Energy Technology Plan (SET Plan) plays a key role in the European energy policy.

The SET Plan is one of the core initiatives of the Research, Innovation and Competitiveness dimension of the Energy Union strategy. It responds to new challenges needed for accelerating the European energy system's transformation towards a competitive low-carbon economy, and places consumers at the heart of the system.

The SET Plan helps to coordinate national research and innovation activities by promoting cooperation among European countries, industrial companies, research institutions, and the European Commission itself. It also supports the most impactful low-carbon technologies and facilitates the funding of projects. The JRC's work in the field of energy storage is brought together in the SET Plan within the Temporary Working Groups (TWG). The JRC coordinates the TWG on Batteries and E-mobility and participates in the TWG on Optimised EU Power grid.

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Protecting the future smart grid against cyber attacks

The SEGRID (Security for Smart Electricity GRIDs) project

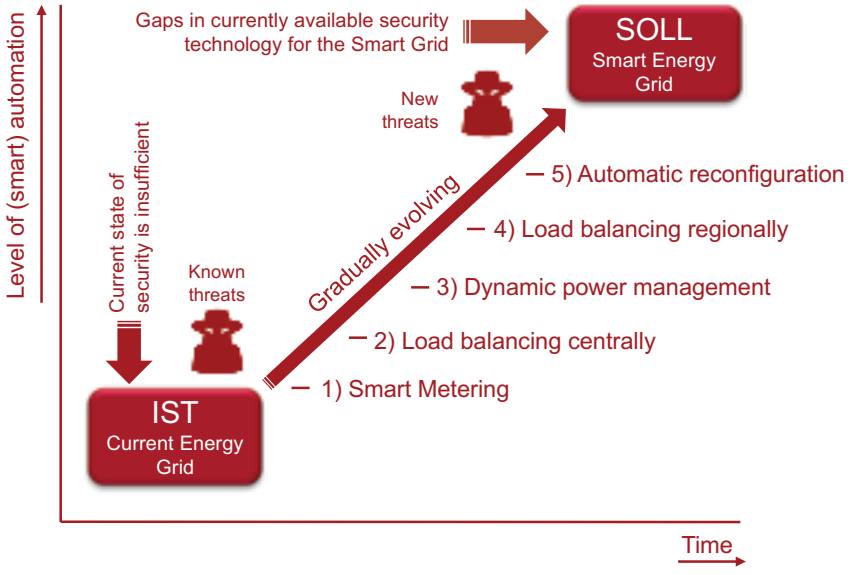
To manage all changes that occur in the electricity grid, it will be equipped with intelligent devices for sensing, monitoring, control, automation and communications – the electricity grid evolves to a Smart Grid. The introduction of the Smart Grid in combination with the entrance of many new and inexperienced stakeholders will dramatically increase the threat surface for malicious attacks on the electricity supply. The cyber-attack on the Ukrainian distribution grid in December 2015 is a prominent example of what could happen and a real-life illustration of the resulting impact. Additionally, the Smart Grid will collect and process large amounts of information, which in many instances will be related to the privacy of customers and must be protected against misuse. The SEGRID (Security for Smart Electricity GRIDs) project, sponsored by the European Framework 7 research and development program, addresses the challenges that arise with the introduction of the Smart Grid. Because the SEGRID consortium includes scientific partners, applied research organizations, manufactures and DSO's, the results are scientifically sound but also applicable in practice in the near future.

The Smart Grid will not come into existence overnight; it will be composed of a mix of old, even legacy, and new components. The Smart Grid can be seen as a gradually evolving system in which new functionalities are added to accommodate new use cases with the challenge to maintain security, privacy and dependability of the Smart Grid as a whole. Within the SEGRID project the work has been focused around five concrete use cases:

1. Smart meters used for on-line reading of consumption and technical data;
2. Load balancing renewable energy centrally;
3. Dynamic power management for smart homes, smart offices, and electric vehicles;
4. Load balancing renewable energy regionally (substation automation);
5. Automatic reconfiguration of the power grid.

These five use cases reflect important steps in the developments of the Smart Grid, and will cover the most relevant security and privacy issues that will arise. The use cases are of increasing complexity and automation (see figure 1).

Figure 1: SEGRID use cases



SEGRID will run until the end of 2017 and has already achieved very good results, such as:

- SEGRID Risk Management Methodology – Risk management ensures that effective security controls are implemented in an efficient and effective way, limiting the exposure to cyber incidents. SEGRID developed the SEGRID Risk Management Methodology (SRMM) that builds on state of the art risk assessment methodologies

while providing guidance and enhancements for use in Smart Grids. The SRMM is supported by a tool and by practical guidance for each step of the method. The SRMM applies a stakeholder oriented approach which takes into account the dependency between Smart Grid stakeholders.

- Vulnerability threat modelling – A vulnerability threat modelling tool models a network architecture and all of its components and simulates how difficult it is for cyber-attacks to be successful. SEGRID has proposed enhancements to an existing tool called securiCAD, to make it more suitable for use in Smart Grids and for use in operational environments, so that changes in a network architecture can be instantaneously fed into the model and analyzed.

- Security and Privacy Architecture DEsign (SPADE) – The SPADE iterative process has been conceived to design, validate and evaluate security and privacy architectures for Smart Grid systems. The SPADE process produces as final outcome a security and privacy architecture, ready to be deployed to fulfill the identified security and privacy requirements, employing Security-by-Design and Privacy-by-Design approaches.

Based on Risk assessments that were conducted, the following security measures were developed and tested:

- Resilient SCADA system – Supervisory Control and Data Acquisition (SCADA) systems form the backbone of critical infrastructures. One of the major threats of SCADA systems is an attacker that gains access to the SCADA system, which can result in a catastrophic scenario. In SEGRID, we have developed a SCADA system that is able to operate correctly even under intrusions. The key idea is to replicate the SCADA system, allowing replicas to deterministically execute the same sequence of requests (e.g., operator commands) in such a way that, despite the failure of a fraction of the replicas, the remaining ones have the same state and ensure correctness of the offered services.

- Resilient communication infrastructure – Smart Grid applications are typically run in equipment inside the (primary) substation and are connected to e.g. the head end system. In SEGRID, we have focused on improving the resilience of the communications outside of the substation, as these are spread over large geographical areas, and consequently are more prone to failures. We have designed and implemented a new Software Defined Network (SDN) based solution to manage the network, which connects the primary substations to the control center(s) of a DSO.

- Improved resource management for (D)TLS – In Smart Grid systems, the TLS and DTLS protocols emerge as the de-facto solutions for secure communication between for instance, SCADA units and RTUs in secondary substations. However, the protocol suffers from a severe security vulnerability, which makes (D)TLS servers highly exposed to a Denial of Service (DoS) attack. SEGRID has proposed a solution that neutralizes the DoS attack described above. The proposed solution does not break current standards, and has been successfully tested on real RTUs communicating over a secure DTLS channel.

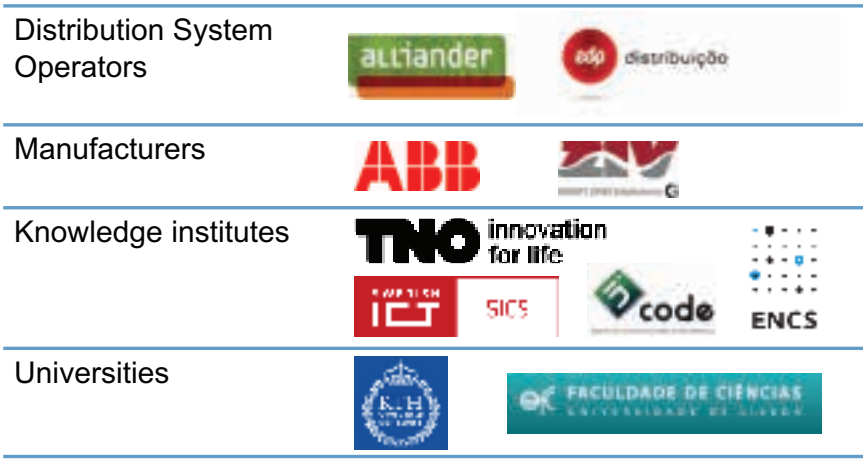


Figure 2: SEGRID project partners

This work was funded by The EC as part of the EU FP7 SEGRID project under Framework 7 agreement 607109. The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the EC.

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Ignoring energy storage was a big mistake in the past

By Brittney Becker (EASE Policy Officer) and Michela Bortolotti (EASE Communications Officer)

For many years, energy storage was not considered a priority for the energy system, in part because the technologies were not yet economically viable and in part because the benefits of storage were valued less in a centralised fossil fuel-based energy system. However, as Mr Dominique Ristori, Director General at DG Energy of the European Commission has admitted, "ignoring energy storage was a big mistake in the past". Today, this situation is rapidly changing due to the cost-performance improvements in energy storage technologies and the public policy commitment to decarbonisation, leading to a significant increase in RES as a share of electricity generation.

To implement the goals of the Energy Union and to advance the energy transition, the European Commission issued the "Clean Energy For All Europeans" package in November 2016[1][3]. This includes several key pieces of legislation with three main goals: putting energy efficiency first, achieving global leadership in renewable energies, and providing a fair deal for consumers. The aspects of the package specifically touching on energy storage, as well as other barriers affecting the energy storage business case, were also addressed by the Commission in a Staff Working Document issued in February 2017[2][4]. EASE welcomes these steps to ensure that EU policies catch up to the many changes taking place as Europe transitions towards a more efficient and decarbonised energy system.

Although the European Commission[3][5] and the European Parliament[4][6] recognise the importance of energy storage, the regulatory framework at EU and Member State level has not yet evolved to support the cost-efficient deployment of energy storage. For instance, the lack of a definition of energy storage at EU level leads to uncertainty about how energy storage devices should be treated under current regulations. Fortunately, this issue is addressed in the recast Electricity Directive[5][7]. Demonstration projects for first of a kind real-scale technologies continue to face regulatory barriers. Additionally, a fair market design is lacking for energy storage systems. Requirements in the network codes, which in some cases can be onerous for energy storage devices as they do not take into account the unique attributes of energy storage devices, also constitute barriers to energy storage deployment. The right approach would be to allow for electricity and grid tariffs to reflect the real cost to society. Congestion and availability pricing should be looked at. If a market player increases the stress on the system, he should bear the associated cost. On the contrary, if a market player alleviates the system stress he should be rewarded and not pay any network fees.

Besides the regulatory framework, energy research and innovation play

an important role in the EU's energy strategy. The 2015 Energy Union Communication stated that the EU "is committed to becoming the world leader in renewable energy, the global hub for developing the next generation of technically advanced and competitive renewable energies"[6][8]. The communication on Accelerating Clean Energy Innovation, which was released as part of the "Clean Energy For All Europeans" Package, identifies "developing affordable and integrated energy storage solutions" as one of four priority R&I areas.[7][9] In this communication, the Commission also announces that it intends to deploy more than €2 billion from the Horizon 2020 work programme for 2018-2020 to support research and innovation projects in these four priority areas[8][10]. This represents a 35% budget increase in annual terms from 2014-2015 levels in these areas. This financial support, guided by clear strategic objectives, will play a significant role in accelerating the development of the secure, clean and efficient energy technologies necessary to achieve the EU's decarbonisation goals.

Energy storage devices come in all shapes and sizes and can be deployed at all levels of the grid to provide a multitude of services. This renders defining R&D priorities and supporting technology development in a neutral manner difficult, particularly if we want to encourage the development of technologies in which European industry is globally competitive. This is why EASE teamed up with EERA (the European Energy Research Alliance) to update its Energy Storage Technology Development Roadmap (first published in 2013). The updated Roadmap, (expected by June 2017), provides an overview of all technology developments in the energy storage industry, both today and in the next 20 years, and provides recommendations for how the EU and Member States can further support the cost-efficient deployment of energy storage technologies.

Energy storage is an important component of an increasingly efficient, secure, reliable, low-carbon, and cost-effective energy future and EASE is looking forward to keep on collaborating with the EU institutions to ensure that the full potential of energy storage is used to help deliver efficient, low-cost, fundamental services to society at large.

Clean Energy for All Europeans Package

EASE's Recommendations

1. Establish energy storage as a separate asset class
2. Remove regulatory barriers to demonstration projects
3. Establish a definition of energy storage in the EU regulatory framework
4. Establish clarity on the rules under which energy storage can access markets – in particular, the perceived inability of transmission system operators (TSOs) and distribution system operators (DSOs) to own and operate energy storage
5. Eliminate unwarranted/double charging, in particular the application of final consumption fees to energy storage given that it does not constitute final use of the energy
6. Ensure the procurement of all energy and ancillary services is market-based, subject to a Cost Benefit Analysis

About EASE

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

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1 [3] European Commission: Commission proposes new rules for consumer centred clean energy transition, 2016.
2 [4] European Commission: Commission Staff Working Document Energy storage – the role of electricity, 2017.
3 [5] European Commission: Energy Storage – Proposed policy principles and definition, 2016.
4 [6] See European Parliament: Energy Storage: Which Market Designs and Regulatory Incentives are Needed?, 2015. and European Parliament Report "Towards a New Energy Market Design", 2015/2322(INI)
5 [7] European Commission: Directive on common rules for the internal market in electricity, 2016.
6 [8] European Commission: A Framework Strategy For A Resilient Energy Union With A Forward-Looking Climate Change Policy, 2015.
7 [9] European Commission: Communication on Accelerating Clean Energy Innovation, 2016.
8 [10] The priority areas are: (1) Decarbonising the EU building stock by 2050: from nearly-zero energy buildings to energy-plus districts; (2) Strengthening EU leadership on renewables (RES); (3) Developing affordable and integrated energy storage solutions; and (4) Electro-mobility and a more integrated urban transport system.

The FP7 DEMETRA project helps machines become more efficient, reliable and silent

Mechanical power transmissions are extensively used in many industrial sectors, such as transportation, energy production and industrial automation. In such areas, where the impact on the environment is a key factor in assessing system performance, they represent a failure-prone subsystem, responsible for substantial energy losses and noise emission.

The industrial partner (Siemens Industry Software, Belgium) and the two academic partners (University of Calabria, in Italy, and KU Leuven, in Belgium) of the DEMETRA project are developing advanced modelling and testing technologies to enable multi-attribute simulation and optimization of mechanical transmissions, as to increase efficiency and durability of industrial machinery while reducing noise and vibration levels.

Due to current trend towards system lightweighting, structures are becoming lighter and more flexible, which makes conventional analysis methodologies incapable of providing optimal design parameters, since it is no longer possible to optimize separately the different components, due to their mutual effects in the full dynamic response. Innovative methods are needed to enable improved virtual prediction and system-level performance optimization.

Supported by the Marie Curie Industry-Academia Partnerships and Pathways (IAPP) scheme, the DEMETRA researchers are joining expertise and efforts to establish a simulation methodology that is capable of capturing the system non-linear dynamics in a multi-discipline integrated, detailed, yet computationally efficient way. The resulting cross-fertilization of industrial needs/expectations and state-of-the-art research methodologies is enabling the achievement of:

- Efficient simulation models and algorithms for capturing the non-linear dynamics of gearboxes;
- Multi-attribute optimization strategies from upfront design arrangements, to macro-geometry definition and micro-geometry refinement;
- Model validation on dedicated test-rigs and system-level cases;
- Novel techniques for transmission error measurement.

In parallel with the challenging scientific objectives of the project, one DEMETRA priority has been set in promoting full career development of the involved Fellows through their participation in a comprehensive programme of activities for scientific and transferrable skills training.

For more information visit the project website at **www.fp7demetra.eu** or contact the project coordinator at **domenico.mundo@unical.it**

The research leading to these results has received funding from the People Programme (Marie Curie Actions) of the European Union's Seventh Framework Programme FP7/2007-2013/ under REA grant agreement n°324336 – DEMETRA: Design of Mechanical Transmissions: Efficiency, Noise and Durability Optimization.

Solar Thermal Glass Facades with Adjustable Transparency FLUIDGLASS

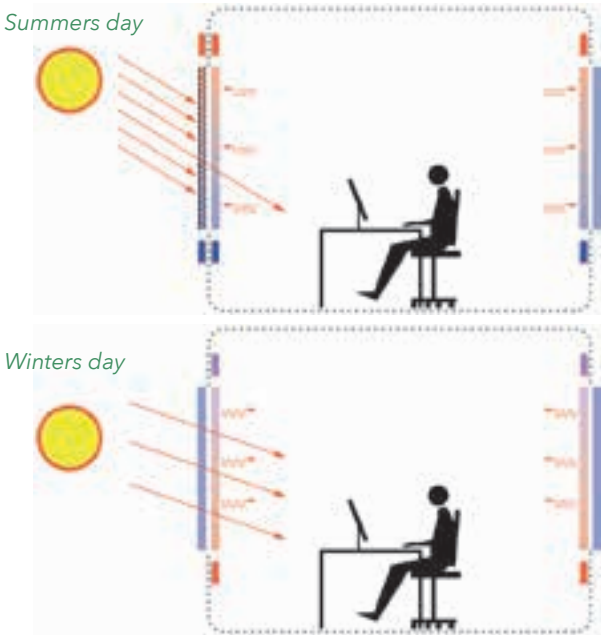
The heavy use of energy from non-renewable resources is one of the biggest problems of our time. Efficient use of energy is becoming more relevant than ever, and it must be implemented in all sectors of human activity.

The highest contributor to the generation of Green House Gases is the creation and operation of built environment. The average value is estimated in most developed countries at close to 33%, knowing that around 40% of the total energy use corresponds to buildings, while their fossil fuel heating represents a major share. Consequently, the built environment in Europe needs to be designed, built, operated and refurbished with much higher energy efficiency.

A new and innovative concept of solar thermal façades has been developed in FLUIDGLASS project for use at building level, increasing flexibility and energy efficiency. Liquid is circulated in spaces of transparent window panes, transforming passive façades into active collectors that are capable to react on changing interior and exterior environmental conditions. This opens new routes of advanced thermal building management embedded in energy networks at district level to significantly improve the thermal performance of the building envelope and the comfort for the user.

The collector panel is a combination of fluid and glass layers and a thermal barrier. In this way, an optimized configuration of the layers can be assembled for different applications and different sections of the building envelope. The basic element of FLUIDGLASS remains the same, but the combination of the different layers allows wide applicability and simple production process. For example: Shading can be provided by tinted glass or fluid (fixed or adjustable). This modular approach has the advantage to offer customized panels depending on the user's need.

FLUIDGLASS modular layer approach



Basic operating modes of advanced approach with two fluid layers

In the most advanced approach, two fluid filled layers are implemented in the glass façade. These two layers regulating all energy flow within the façade. The fluid layer to the interior space keeps the inside surface temperature just below or above room temperature for heating and cooling, while the liquid layer to the exterior controls the energy transmission by absorption of the solar irradiation.

FLUIDGLASS proposes a disruptive innovation in façade systems - transparent solar thermal façade system combining solar thermal collector, insulation glazing, shading device and heating/cooling panel in one element. This unique system doesn´t offer just a better performance characteristics than competing products, moreover it is the only solution for a large number of glazed buildings where opaque collectors cannot be installed due to aesthetics, usage or construction type reasons. Since FLUIDGLASS allows all these additional buildings to become potentially net-zero in heating and cooling, the macro economic impact is by far higher than the impact of competing approaches, which only offer slight efficiency improvements for existing solutions.

The project FLUIDGLASS receives funding from the European Union Seventh Framework Programme (FP7/2007-2013) under Grant agreement n° 608509.

www.fluidglass.eu

Clean Energy Package: District Heating to Boost EU Energy Transition

By Dana Popp (pictured), Euroheat & Power

2016 marked the end of the process that brought the heating sector in general, and district heating and cooling in particular, to the centre of the EU energy policy debate, culminating with the publication of the first ever EU Heating and Cooling Strategy.

With this occasion, our district heating and cooling industry, represented in Brussels by Euroheat & Power, firmly established its status as an enabler for the energy transition. District heating can efficiently integrate renewable energy sources such as biomass, geothermal and solar thermal energy. Moreover, district heating networks can help balance power networks by using excess electricity (via large scale heat pumps) and acting as energy storage. Finally, utilising excess heat from industrial sites and the services' sector across the EU can significantly reduce the sector's dependency on fossil fuels.

But this was only the beginning. At the end of 2016, the European Commission issued the so called "Clean Energy Package", a set of new legislative

Solar district heating collector field in Dronninglund, Denmark (Photo: Arcon Sunmark)

proposals aimed at revamping Europe's energy and climate policies and aligning them with broader international commitments under the Paris Agreement.

As more than half of Europe's energy is consumed for heating purposes, any policy initiative to decarbonise the energy sector would fail without addressing the topic of heat. Today, around 75% of Europe's heat demand is met with heat from fossil fuel based sources, namely natural gas, oil and coal. The fragmented heating market makes it difficult to integrate more renewable energy in the system, especially with a widespread use of individual natural gas boilers.

Euroheat & Power works now closely with policy-makers to ensure the uptake of the heating and cooling strategy's vision throughout the new legislative proposals: the decarbonisation of European buildings based on energy efficiency, the shift to renewable energy and the synergies between heating and cooling and the electricity system through means of efficient district heating.

The key legislative piece of this package for our industry is without a doubt the new Renewable Energy Directive. The proposal includes for the first time a substantial part dedicated to the decarbonisation of the heat sector, as well as special provisions on consumer rights and market structures in district heating.

The draft directive, in line with the earlier published strategy, reaffirms the strong conviction by European and national policy makers that district heating can and must play a central role in decarbonising Europe's heating and cooling sector. This newly found support opens some great opportunities for district heating, and now it is up for the industry to live up to expectations and deliver its part in the energy transition.

The brand new article 23 of the Renewable Energy Directive draft is a key section which discusses the need to increase the share of renewables in heating and cooling. A leaked version of the proposal, which was released a few weeks before the directive was officially adopted, created an obligation for Member States to increase the share of renewables in heating and cooling. The text was unfortunately made less emphatic in the version that was later officially published by the European Commission, but it nevertheless represents a first step in the creation of a framework for dramatically increasing the role of renewable energies in the heating and cooling sector, working

to achieve Europe's long-term greenhouse gas emission goals.

An immense opportunity to decarbonise European heating is right in front of us. European industries, such as steel production or power production, currently produce enough surplus heat to potentially meet 100% of the EU heat demand. However, most of it is being wasted, even though the technology to capture this heat and direct it to district heating networks is mature, affordable and already widespread. An increasing number of district heating operators, especially in the Nordic counties, is investing in excess heat capacities working with industrial installations, data centres, hospitals, supermarkets. European cities, for instance Frankfurt and Stockholm, have placed excess heat at the forefront of their decarbonisation strategies – it is a low carbon, cost

Excess heat from data centres can be reused via district heating networks (Photo: iStock)

efficient and clean heat, which helps reduce dependency on fossil fuels.

For the first time, the draft directive highlights the potential of recovering excess heat and emphasises its role as valuable resource. But in order to help Member States fully embrace the potential of excess heat and provide necessary support for its exploitation, the right policy framework must be in place. Euroheat & Power therefore recommends to treat excess heat in a similar manner as renewable energy and allow Member States to achieve their renewable energy target for heating incorporating more excess heat in their systems. The synergies between excess heat and renewable heat will surely allow Member States to decarbonise the sector, reduce emissions and phase out fossil fuels in a much more cost-efficient way.

The Clean Energy Package constitutes without a doubt a significant milestone in the process of building a regulatory framework for the European energy transition. If we get the details right, this package will allow district heating and cooling networks to fully realise their potential to bring efficient, low carbon heating and cooling to the heart of cities all across the EU. We are ready to do our part in delivering the Energy Union.

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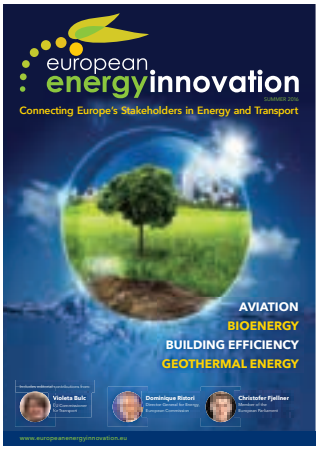

AVIATION

"... aviation must grow in a sustainable manner to ensure the competitiveness of air transport."

Innovation is key for sustainable aviation

By Monika Hohlmeier, MEP

The Aeronautics Sector is a strong driver of economic growth, high qualified jobs, trade and mobility for the European Union. The EU aviation industry directly employs up to 2 million people and overall supports around 5.5 million jobs. While the number of passenger planes is expected to double between 2015 and 2035, without further measures, CO_2 emissions from international aviation are estimated to quadruple by 2050 compared to 2010. In fact, if global aviation was a country, it would rank in the top 10 emitters.

As mentioned in the Aviation strategy of the European Commission, growth in air traffic in Europe and worldwide must go hand in hand with maintaining high standards of aviation safety as well as contributing to the fight against climate change. In short, aviation must grow in a sustainable manner to ensure the future competitiveness of air transport. However, that is very difficult to realize as the aeronautics industry is one of the most global industries, which is faced by a fierce global environment. Especially, the international aviation sector outside Europe is characterised by very strong growth – up to 10 percent in certain world regions, such as the Middle East. For that reason, maximising fuel efficiency, using less to go farther, is also a key cost-cutting factor in a very competitive industry. As game-changing innovation in this sector is risky, complex and expensive, and requires long-term commitment, all relevant European stakeholders must work together to develop proof-of-concept demonstrators. For that reason, the continuation of the very successful grant-based funding scheme of the European Commission is crucial to maintain the competitiveness of European companies and research institutions in a time of increasingly fierce global environment. In addition, the flight ticket taxes and fees related to CO_2 emissions should be reinvested solely in research and environmental innovation efforts aiming to achieve carbon neutral growth for aviation.

As sustainable aviation is highly dependent on innovation, the aeronautical industry is recognised as one of the top five advanced technology sectors in Europe. It is one of the most R&D intensive sectors in Europe, dedicating more than 12% of its turnover to research and development and 16% of its employees work in R&D. For that reason, the European Parliament in general and the members of the Sky&Space Intergroup in particular are always supporting research activities by the industry through Horizon 2020 funded projects like Clean Sky as well as SESAR.

Clean Sky has been an unambiguous success story not only environmentally, but also in establishing a robust innovation network in bringing together companies, universities and public laboratories. In detail, Clean Sky has brought together over 560 participants, with around 40% being innovative SMEs. This joint undertaking shows also that a private public partnership in funding, established by the EU and the European aeronautical industry, is very successful. The initial Clean Sky Programme, which was running from 2008-2016, had a budget of €1.6 billion. The European Commission's Framework Programme 7 provided half of this amount and the other half was provided by financial contributions from the industry leaders. It is estimated that the technology developments made could reduce aviation CO_2 emissions by more than 20% with respect to the 2000 baseline levels which would mean an aggregate reduction of 2 to 3 billion tonnes of CO_2 over the next 35 years. Following

the success of the initial programme, its successor, Clean Sky 2, was launched in 2014 as part of the Commission's Horizon 2020 Research and Innovation Programme and is running until 2024. Clean Sky 2 with its more ambitious goals, such as reducing noise levels by aircraft in general, CO_2 emissions by 75% and the very toxic mono-nitrogen oxides by even 90% is the largest European research programme developing innovative, cutting-edge technology with a budget of not less than €4 billion. The EU contributes €1.8 billion from the Horizon 2020 programme budget whereas industrial partners contribute €2.2 billion. The focus of this programme is on measures, such as developing new engine architectures especially with increased aircraft fuel efficiency, improved wing aerodynamics, lighter composite structures and more electrical on-board energy.

SESAR, the Single European Sky ATM Research project, aims to improve Air Traffic Management (ATM) performance by modernising and harmonising ATM systems through the definition, development, validation and deployment of innovative technological and operational ATM solutions. The goal of SESAR is to ensure sustainable development of the air transport sector in Europe. The main objectives are the tripling of capacity and increasing safety in the same time, the improvement of environmental performance by 10% per flight as well the reduction of air traffic management costs by 50%. The overall budget of €3,7 billion is funded equally by the European Commission, the industry and Eurocontrol, the European Organisation for the Safety of Air Navigation.

These innovative flagship projects have to be a key priority for the EU also in the next MFF. Only with appropriate funding it can be ensured that the ambitions turn to concrete outcomes and strengthen the competitiveness of our aviation sector. It is highly necessary to have budgetary certainty on the long run for a successful implementation phase of the running programmes and for future programmes as a possible Cleansky 3 which has to be established after 2020. ●

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Clean Sky – a European partnership for new energy-efficient aircraft technologies

By Tiit Jürimäe (pictured), Interim Executive Director at Clean Sky 2 Joint Undertaking

In 2017 Clean Sky's first programme will draw to a close. As we look back and recap on the remarkable years since the start of the programme in 2008, we can only confirm what an extraordinary journey this has been. This major European aeronautics research initiative has reviewed thousands of components used in current aircraft and helicopters to identify the areas that can be significantly improved in order to reduce CO_2 emissions and noise by 2020.

Since 2008, some 20 large Demonstrators have been completed by 600 participants in 24 European countries, bringing together thousands of experts from leading companies, universities, SMEs and research centres to work around a common European programme. As an example, seven key Demonstrators that have been achieved within the Clean Sky programme offer a tangible glimpse into the future of innovative technology in the aviation sector: the Tech 800 demonstration engine, Advance Low Pressure system engine demonstrator, the regional turboprop flight test, Bluecopter, Multi Criteria Departure Procedure, COPPER Bird and the Open Rotor. From optimising missions and trajectories, more lightweight structures, improved aerodynamics and propulsive efficiency, Clean Sky is delivering ground-breaking results by translating innovative ideas into cutting-edge technological solutions for the greener and quieter aircraft of the future.

Above all, Clean Sky is a true European collaboration. It's about working together at the European level to develop the green technologies that both public and private sectors believe could improve our environment and help us stay competitive, and thus ensure we meet European societal demands for a better quality of life and future prospects.

This year we are celebrating the 60th anniversary of the European project. In March, the European Commission issued a White Paper on the Future of Europe to launch a debate on future directions, as we remember that Europe has always been at its best when it is united, bold and confident that we can shape our future in partnership. The great partnerships that Clean Sky has developed are even more important in these turbulent times of protectionism and nationalism, let alone globalisation. Collaborating at the European level has helped the European aeronautics supply chain stay in good shape, by spreading into new regions and countries and playing a role in building a Europe with more growth and jobs.

The results of our collaborative research at Clean Sky are well-placed in the bigger picture of the EU's vision on sustainable transport in Europe, through environment, mobility, and competitiveness pillars. It is evident that the aeronautical industry is a continuously growing sector of excellence in Europe. However, in order to tackle aviation's impact on the planet and to cement the industry's growth for the future, we cannot rest on our laurels. Clean Sky was established

in 2007 out of such challenges which lie at the heart of its raison d'être: the environment, competiveness and mobility – as we strive to develop more innovative and greener aircraft today to better equip the European aviation industry of tomorrow. With the adoption of the historic Paris Agreement on climate change and the release of the European Commission's new Aviation Strategy it is clear – aviation and the whole transport sector need to do everything possible to accelerate the development and introduction of environmentally friendly products and services. It underlines that the objectives and goals set out for Clean Sky have been significant steps in the right direction and are more important today than ever before.

As we survey the horizon, our joint stand with the European Commission at the upcoming Paris Le Bourget Air Show in June 2017 will highlight the large investment that the European Union is making in sustainable aviation through many related programmes such as Clean Sky but also SESAR, Marie Curie or the SME instrument. Many companies, research centres, universities across European regions are already part of this big effort to improve the energy efficiency and environmental performance of aviation and to keep Europe at the forefront of innovation. Our objective at Le Bourget is to reach out to even more potential participants and reward the talent from every corner of the European Union. Working together we will be able to maintain European leadership and to solve the societal challenges for the benefit of all. The European Commission and the Clean Sky 2 Joint Undertaking are ready to join you in this journey for a stronger Europe. Come and visit us at Le Bourget 2017!

More information on **www.cleansky.eu**

Aviation Strategy for Europe: Europe can't afford to miss on this opportunity

By Pavel Telička (pictured), Vice-President of the European Parliament

Sustainability is the most pressing challenge ahead for the aviation sector. So far, the EU has been successful in setting up the world agenda to reduce GHG emissions, firstly with the Paris agreement, and consecutively last autumn in ICAO with the agreement on a Global Market Based Mechanism.

The challenge ahead is as huge as the resulting opportunities and whether the EU will live up to its expectations should be no question.

Historically, aviation is one of the most Europeanised policy in the transport sector and its gradual liberalisation one of the most successful

of its kind: setting the framework for cheap air tickets, an increased connectivity throughout the EU and the development of a strong and safe European aeronautics industry.

Thirty years later, while aviation is becoming more popular, in a trend that seems to be irreversible, EU policy is in need of fresh air to respond to the new set-up of the international scene, where international competition is growing as much as the awareness about climate change. With the publication of its Aviation Strategy for Europe, the Commission initiated a momentum for the redefinition of a long term vision for the sector, which I tried to input through my report.

A strategy for aviation in Europe can only be such if we take a comprehensive view of the aviation sector as such, if we include it in a complete picture of the transport sector as a whole, and eventually if it reflects upon the integration of transport policies within other policies. Only then we can aim at concerted actions that will enable to produce a truly efficient EU policy against climate change.

A common mistake in policy making is the temptation to adopt a fragmented approach: dealing with one topic after the other. Too often the risk is to end up with a lack of global coherence or to miss on opportunities. An example is the aviation strategy and the circular economy package: while both files share an obvious link with the environment and the fight against climate change and while both discussions took place more or less in parallel, instinctively no one would draw any link between them. That is a pity because the aviation sector, to a certain extent, can be a practice field for experiments in the field of the circular economy, whether is it for waste management or recyclable fuels.

Too often transport policies are excluded from the spotlight, either because they seem too technical or because we fail to demonstrate their impact on the everyday life, and the only moment we remember about transport is to blame it for its emissions. Actually, the fact is that transport policies are about mobility and therefore whoever claims that the answer to less emission is less air travel is mistaken. Not only this is denying that in quite few cases there is no alternative to air connection, but this easy way out is also neglecting the performance of the EU aeronautic industry and the even greater potential that is facing it. Of course this doesn't mean that we should blindly support air connections between every single city in the EU.

A key element of the strategy is the integration of the aviation sector within the other modes of transport and that is why I support the development of an air connectivity index which should aim at a resilient transport network, built on the complementarity of each modes of transport. In order to do so, such an indicator should take into account not only frequency and time of a connection but environmental aspects and the availability of other modes of transport.

The success of the CleanSky programme proves that a combination of technology and innovation are the path to success in reducing emissions. Galileo is another example of an EU programme whose potential for the aviation sector still needs to be fully seized, for instance to enable more optimised landing operations.

The aviation sector is not limited to air travel and the reduction of emissions also concerns airports and all their operational activities. Many airports are already investing in more efficient facilities and equipment to reduce emissions and noise for their operations and those initiatives should be encouraged. Another relevant aspect is the actual access to airports: if for many airports we can already identify the least polluting way to reach the airport, for some airports there seems to be no alternative to private cars.

Fighting climate change creates an opportunity for our industries, but the same opportunities are open to their competitors as well and that is why I wish for EU industries to make a full use of the available EU programmes and funds to strengthen their position and to lead the way towards the decarbonisation of air travel.

Aviation emissions: Looking towards the long-term

By Michael Gill (pictured), Executive Director, Air Transport Action Group

The end of 2016 witnessed a major milestone in aviation's climate action plan. At the 39th Assembly of the International Civil Aviation Organization (ICAO), the UN body responsible for aviation, member states agreed to introduce an economic mechanism to address aviation's carbon emissions growth. This scheme, the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is an historic development which will allow aviation to meet its medium-term goal of carbon-neutral growth.

In the years leading up to 2020, when the scheme will formally begin operating, the industry will be focusing on capacity building, working with ICAO to make sure that airlines and governments worldwide are prepared for its implementation, as well as encouraging additional States to sign up for the initial voluntary stages of the scheme, which run from 2021 to 2027. So far, 66 States have agreed to participate in the voluntary stages. We hope that number increases. But with those volunteers and the states which will join the scheme in its second, mandatory, phase, already over 80% of aviation's emissions growth after 2020 will be covered.

However, our work certainly does not finish in 2020. Although CORSIA is undoubtedly a major achievement, its role is merely to ensure that aviation's growth in emissions is stabilised, whilst other measures are gradually put in place to reduce the overall environmental impact of air transport.

Looking towards the long-term, aviation's goal is to halve net CO_2 emissions by 2050, compared to 2005 levels. This will be a significant challenge. It is achievable, but will require substantial commitment and investment from the industry, governments and international institutions.

To meet this goal, the industry must focus on two key areas: developing new, even more efficient aircraft technology and commercialising sustainable alternative fuel.

Sustainable alternative fuels have the potential to reduce aviation's carbon emissions drastically. These fuels can be up to 80% less carbon intensive over the course of their lifecycle when compared to traditional fossil-based jet fuel. Alternative fuels can be synthesised using a wide range of different feedstocks, from sustainable crops (which do not compete for land with food growing), to municipal waste, algae or even used cooking oil. We now have five officially approved 'pathways', or methods by which the fuel can be produced, providing the industry and its fuel supplier partners with a high degree of flexibility.

The drive towards the enhanced use of sustainable alternative fuels has been increasing rapidly over the course of the last few years. Since the first commercial flight using alternative fuel

by Virgin Atlantic in 2008, significant progress has been made. By the end of 2016, over 5,500 commercial flights had been operated by a number of airlines using alternative fuel from a wide variety of sustainable feedstocks and to date, there are three airports regularly supplying sustainable alternative fuel, Oslo, Stockholm and Los Angeles, and a number of airlines have signed offtake agreements with fuel suppliers.

The challenges facing the large-scale deployment of sustainable alternative fuels are not technical, but economic and political. What we now need is for the production and use of alternative fuel to be economically viable. This is where governments can help the industry, putting in place the right policies to incentivise their production. If this happens, the coming years could see aviation significantly increase the proportion of alternative fuel used by airlines, leading to major environmental gains.

While the sustainability credentials of sustainable alternative fuels are compelling, their use is unlikely to be enough to reduce carbon emissions at the scale needed to reach our 2050 goal. For this, we will need to develop disruptive new aircraft technology that lessen (or ideally remove) our reliance on CO_2-emitting jet fuel.

While the feasibility of developing fully-electric aircraft is still to be proved, battery technology has been advancing at an encouraging pace, making the possibility of a fully-electric commercial scale aircraft far more likely in the future. We have already seen prototypes of small, two seater electric aircraft in the shape of Airbus' E-Fan and Siemens' 330LE. The European Union project, Clean Sky, and the US government-funded NASA are also active in this field.

Hybrid-electric commercial aircraft, which use traditional jet fuel propulsion for take-off and landing, with electricity used to power the cruising phase are more likely to be feasible in the coming decades. This April, for example, has just seen an announcement by Zunum Aero, backed by Boeing and JetBlue, of a regional-sized hybrid-electric aircraft that it is hoped will be ready by the mid-2020s.

With the continuing commitment to both alternative fuels and new aircraft technology, the future looks bright for aviation's sustainable future.

For more details on how aviation is working to cut CO_2 emissions, check **www.enviro.aero/climatesolutions**

The keys to decarbonising Europe's heating and cooling

By Thomas Nowak, Secretary-General of the European Heat Pump Association (EHPA) www.ehpa.org

5 factors are holding back the energy transition to a zero emissions Europe by 2050, writes Thomas Nowak.

The way we use energy in our society needs to change if we want to keep global warming well below 2°C, as stipulated at COP21 in Paris. This transition needs to include decision-makers on all levels and must above all include citizens.

A world without fossil fuels seems daunting, but the energy transformation is already happening: it's entering people's psyches, production cost is going down, and it's 'cleaning out' our grids: in 2016, 86% of the new capacity built across Europe came from renewables, that's 21.1GW of new clean energy power entering our system.

This is true for electricity, but where is heating and cooling? The sector is responsible for 51% of final energy use in Europe and about 27% of CO2 emissions. Decarbonising heating and cooling is a tremendous challenge: even in new buildings, the market uptake of low emission technologies is too slow and the renovation sub-sector is suffering from an even lower renovation rate.

Heating and cooling is a sector governed by tradition. If you need heat, you burn something – this is common practice, understood and mostly unchanged since our early forefathers lived in caves. Cooling started with ice and quickly moved to electricity, using the refrigerant cycle. Important in everybody's daily lives, heating and cooling technology is hidden in basements and on rooftops connected via pipes and tubes to radiators, floor heating systems or ceiling boxes.

A good heating/cooling system is a working system – out of sight, out of mind. On commercial levels and in industrial processes, the same applies on a much larger scale. Functionality and reliability have too often been prioritized over innovation: why change a running system? Heating and cooling is not characterized by short innovation cycles and many systems are operated

Decarb Heat Forum | 11-12 May 2017 in Brussels | Acting together to decarbonise Europe

even past their expected useful life. Yet, we do need to increase the speed of change and we need it to happen fast if we are to get to zero emissions by 2050, only 33 years away.

The energy transformation implies an overhaul of the entire value chain, from research and development to manufacturing to installation and maintenance. Today's heating industry is still dominated by fossil fuels with market shares of green heating solutions not even close to the level needed for reaching zero emissions.

But there is a bright side to it: technologies for a decarbonised sector exist and manufacturers know how to make and deploy low-to-zero emission "2050-ready" heating solutions, air conditioning systems and cooling equipment. In the construction sector, the know-how to build, refurbish or renovate a building to near zero energy standards exists. And industry is experimenting with circular economy concepts that include reusing energy.

If technologies exist, what is the problem? Five key factors are inhibiting green solutions from being the most cost efficient and most easily deployed:

1. Subsidies for fossil fuels prevail across the EU, keeping operation costs artificially low. With the investment costs of greener solutions still higher, the additional costs are rarely recovered over the useful life of the installation.

2. There is no price signal influencing the negative environmental impact from burning fossil energy in the heating sector. Electricity is covered by the European Trading Scheme (ETS), but combustion-based heating is not covered.

3. While you can find financing solutions for buying a new car, the banking sector does not facilitate investing in new heating solutions, distribution infrastructure and building systems that would lower energy consumption.

4. Current heating solutions benefit from decades of optimization and standardisation. For the installer, this is business as usual: the basic like-for-like replacement, fault-forgiving and recognized as working by the client. This ease of installation has yet to be achieved for "2050 ready" replacement solutions to come to market faster.

5. If a heating system fails, a fast replacement is required, but in such "distressed purchase" situations the suggested replacement is rarely the best long-term solution. Standardized green renovation packages including financing and (if needed) an upgrade of the building envelope must become the modus operandi for business.

Addressing these points will help unleash the power of individual, corporate, and municipal investments in favour of a more fully decarbonised heating and cooling system. This can be re-enforced further. Policy-makers must give a strong signal to end-users and industries on the need for change and the incompatibility of fossil-based solutions with the 2050 goals to reach a zero emissions economy for Europe.

The #DecarbHeat forum (Brussels, 11-12 May) addressed these issues and layed the groundwork by launching the #DecarbHeat initiative. The goal is to encourage a swifter shift to cleaner energy solutions for the ultimate benefit of Europe's citizens. Thanks to the DecarbHeat initiative, the thermal industry has made formal commitments to achieve a 100% carbon emission-free European heating and cooling sector by 2050. 25 representatives of the major players of the European thermal industry signed the Decarb Heat industry Pledge committing thus to align their business development plans with the mentioned vision. The initiative was also supported by nearly50 other organisations and individuals including Brussels Minister Céline Fremault and H.R.H Prince Laurent of Belgium.

The message is clear: full decarnonisation of Europe is possible and starts with heating & Cooling.

For more information please visit www.decarbheat.eu

Spreading and exchanging excellence in Wind Energy Research – the European Academy of Wind Energy

By Elke Seidel, Branch Manager of European Academy of Wind Energy

The European Academy of Wind Energy (EAWE) is a registered body of around 40 European universities and research institutes, which joined their forces in wind energy research and development. EAWE is aiming to be a world-leading wind energy academia and research community, supporting Europe with world fore-front pre-competitive innovations.

The academy aims to enhance wind energy research by integrating and connecting the activities of the highest level academic and research institutes in Europe working on Wind Energy. While wind energy continues its path in becoming Europe's most important future source of clean energy, more and more countries are focusing on the accompanying research as well.

Therefore, the European Academy of Wind Energy is encouraging universities and institutes engaged in wind energy research to join the EAWE community. Combining untapped wind energy R&D potentials – e.g. in the Eastern European countries – with those from the cradle of wind energy will foster Europe's position as the leading wind energy innovation hub.

A main part within the activities of the academy is co-operation, which leads to spreading of excellence and the dissemination of knowledge by supporting the development of international training courses, organizing annual PhD seminars and high-class scientific conferences.

EAWE also encourages integration activities like the exchange of PhD students and senior scientists and the utilization of each other's research infrastructures.

Current main activities within the academy are inter alia the publishing of the long-term research agenda to spur an intensive discussion worldwide within the wind energy community and the implementation of its own scientific journal: Wind Energy Science (www.wind-energy-science.net).

PHD SEMINARS

EAWE organizes annual PhD seminars providing opportunities for PhD students and supervisors from all over Europe to exchange information and experiences on research in wind energy. Participants, especially PhD students, from non-member institutions are welcome.

Mainly organized by PhD students of the hosting institution the event is composed of topical sessions, in which PhD students present their latest activities and findings in talks and within a poster exhibition. The scientific committee is composed of young scientists from EAWE institutions.

The next PhD seminar will be organized and hosted by Cranfield University, United Kingdom in September 19 – 22, 2017 (www.cranfield.ac.uk/events/events-2017/eawe-2017).

THE "SCIENCE OF MAKING TORQUE FROM WIND" CONFERENCE

Since 2004 the biennial high-class scientific conference "The Science of Making Torque from Wind" has become one of the world's leading scientific wind energy conferences. Experts from academia and industry are discussing latest results and developments in fundamental as well as applied wind energy research.

At the sixth edition (TORQUE 2016, October 5 - 7) – organized by the current Vice-President of the EAWE Prof. Dr. Carlo Bottasso – at the Technical University of Munich, more than 530 attendees participated in a high-level technical and scientific programme, including ten sessions, featuring 142 oral presentations and 167 posters. Being one of the largest conferences in wind energy in 2016, it offered countless opportunities for networking and also hosted the plenary roundtable "The Future Needs of Wind Energy Scientific Research", which is available on youtube, too (https://youtu.be/xmvaICNk4wA). The 2018 edition of "The Science of Making Torque from Wind" will be hosted by the Politecnico di Milano in Italy, on June 20-22, 2018.

WIND ENERGY SCIENCE CONFERENCE

The "Wind Energy Science Conference 2017" (WESC-2017), taking place at the Technical University of Denmark (DTU) in Lyngby, is the first of a series of bi-annual conferences launched by the European Academy of Wind Energy (www.wesc2017.org).

The board of EAWE has decided to run a scientific conference every year, with the Torque conference taking place in even years and the WESC in odd years. A main difference between the two


The Science of Making Torque from Wind 2012 in Oldenburg, Germany

conferences is that TORQUE is mainly related to technical sciences, whereas WESC has a broader scope, covering all aspects in wind energy, including i.a. electrical conversion, storage techniques, community acceptance and economics.

The purpose of the Wind Energy Science conference is to gather leading scientists and researchers in the field of wind energy to present their latest findings. In order to cover these latest findings, no papers will be published during the conference. However, the conference is organized in close collaboration with the EAWE Wind Energy Science journal and presenters are encouraged to submit their work to this journal after the conference.

A main idea of the event is that scientists interested in various aspects of wind energy can meet across traditional scientific borders and exchange their latest findings, ideas and results.


PhD Seminar 2013 in Visby/Gotland, Sweden

SUPPORT OF SPECIAL CONFERENCES BY EAWE MEMBERS AND WINDEUROPE

EAWE also supports WindEurope`s conferences as scientific partner. Furthermore the academy promotes public scientific events of its members. One of the next events is the Wake Conference 2017 (May 30 - June 1) in Visby, Sweden (http://standupforwind.se/wake-conference-2017/), which is focusing on wake and wind farm interaction as larger and larger wind farms become reality, being built ever closer to each other offshore, onshore and in complex terrains.


The Science of Making Torque from Wind 2014 in Lyngby/Copenhagen, Denmark

Next Events:

- Wake Conference 2017, May 30 - June 1, Uppsala University Campus Gotland, Sweden
- Wind Energy Science Conference 2017, June 26 - 29, Lyngby, Denmark
- EAWE PhD Seminar 2017, September 20 – 22, Cranfield University, United Kingdom
- TORQUE 2018, June 20-22, Politecnico di Milano, Italy

eawe
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Find further information about EAWE and its activities on www.eawe.eu.

Digital meets energy. Where?

By Kalle Kukk

The Energy domain is entering the era of changes. Coincidentally, this is driven by two major factors. These factors can run independently in parallel but we need to make them cross in order to generate true synergies. The first one stems from energy itself and could be summarized as stakeholders becoming smarter. And this is not just about energy traders, producers and network operators trying to do their business more efficiently.

It is also the consumer whose position in the energy value chain is very different now compared to what it used to be. The consumer is not the passive end ring in this chain anymore, paying numbly the bills of incumbent utilities. Instead, all of a sudden, he has the opportunity to choose between many energy suppliers and service providers to obtain the best deal. Also he can opt for dynamic pricing and decide when to consume, i.e. when the prices are low. Furthermore, he can be a really active player by providing services by himself, e.g. flexibilities to network operators when they ask to either increase or decrease consumption, if it is needed for system balancing or grid congestion management (demand response). And he can also be a (micro) generator himself – the prosumer.

But there are also the policy makers and regulators who enable this new smartness. Setting targets on energy savings, renewable energy or greenhouse gas emissions necessitates other parties to come up with new solutions. Therefore we can see new services and new players emerging – aggregators, ESCOs (energy service companies), energy cooperatives, etc.

Number two factor is the development of information and communication technologies (ICT). Smart solutions and applications, like the internet of things, big data, data sharing platforms, blockchain etc. are more and more prevalent all around us, and increasingly relating to energy.

These developments mean more information, less energy in the system. When energy from distributed generation is consumed locally country-wide grids will not transport that part of energy anymore. But we still need information about it because it is a single market. The energy price is not worked out locally, but in the case of electricity, it is calculated by the hour throughout Europe. Also, generators and consumers still need transmission grid as a back-up and they can still offer their flexibilities across country and regions.

The general aim should be to build links between energy and ICT through digitalization. In fact, they feed each other. Single energy market and digital single market must go hand-in-hand. Digitalisation in energy should be about information exchange andmaking necessary data available to interested parties. This is where digital meets energy.

As the Estonia's electricity and gas transmission system operator (TSO), we have started to reshape our understanding throughout Elering, on traditional grid business, and we see the future in a digital energy system.

As an important step toward this, we are developing a data sharing platform named Estfeed where all interested parties can have access to energy consumption and other related data.

We started in 2012 and within a few months we developed a central data hub containing hourly readings from every single electricity meter. The aim was to ensure neutral access to metering data for all consumers and generators, as well as to facilitate supplier switching in order to be prepared for full market opening a year later.

The conception of data hubs has now reached the European draft legislation stage – Clean Energy Package. But, meanwhile, we have taken next step. Having data hub in place, as a decent cornerstone, Elering sees data exchange as the future for system operators. If we wish to survive all these changes we need to transform from a physical grid operator to smart grid operator. The objective of the Estfeed platform is to create a comprehensive smart energy system that allows market players to interact securely and transparently.

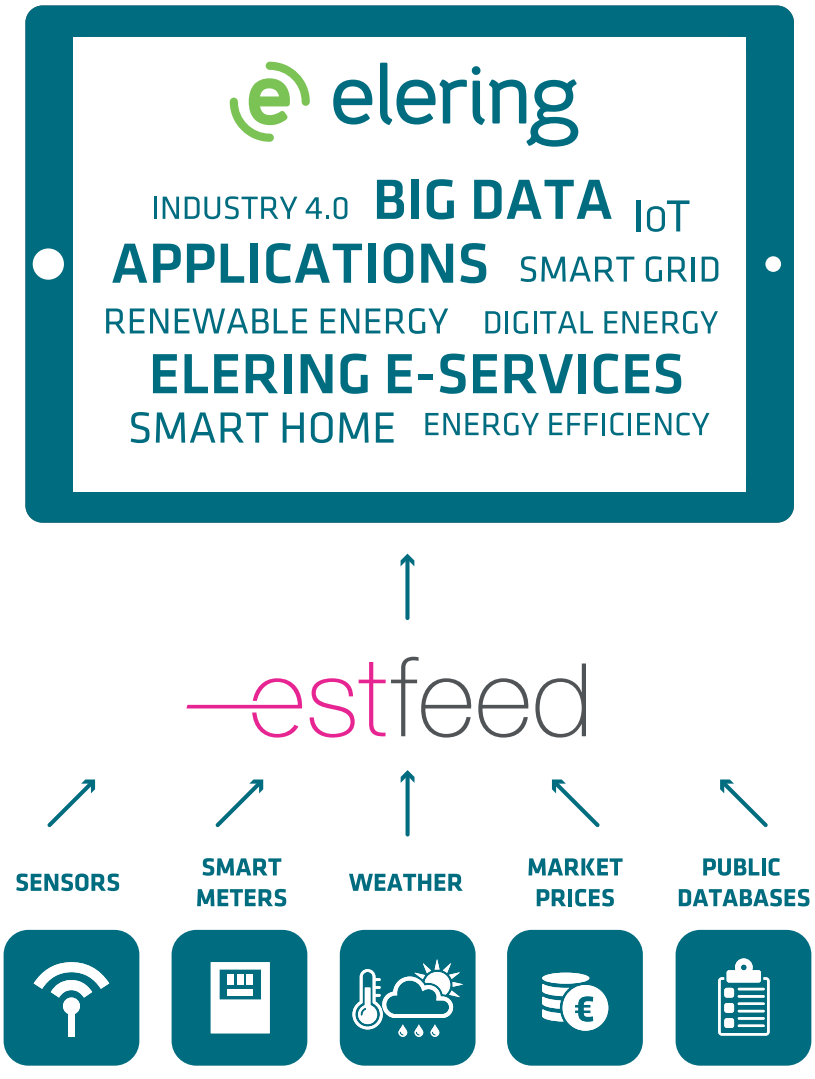
Estfeed brings together data sources and applications. Data sources range from electricity, gas and district heating smart meter readings to weather forecast and day-ahead energy prices. Estonia completed full roll-out of smart electricity meters in 2016. By interpreting and combining these data, developers can create useful applications for themselves or their customers (end consumers). The aim of the applications is to create efficiency,

either for cost optimization or for end consumers. Customers will have access to all data, applications and services through a single portal – e-elering.

But we are already looking for new development paths. If we do agree that digitalization is about data exchange there is no reason to limit ourselves to local solutions both in geographically and horizontally. Rather, the sky is the limit. In cooperation with more than 30 partners across Europe and co-funded from Horizon2020 programme we are willing to contribute to the emerging data management discussions.

Therefore, we have initiated work streams on data management as part of this larger project. The objective is to test and demonstrate data management necessary for flexible market design. Demonstrators will focus on different aspects of data management, including cross-border communication between data exchange platforms and different stakeholders in order to facilitate cross-border exchange of flexibility services with the following elements: cross-border communication, affordable application for smaller distributed demand units, flexibility data exchange application, single user interface, combined access to metering and operational data, cross-sectoral data usage.

Digital meets energy right here and right now. We cannot afford to miss this opportunity. Even if from the system operator point of view it may at first look self-destructive.



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