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The publishers of European Energy Innovation would like to offer their sincere thanks to all individuals and organisations who have contributed editorial images photos and illustrations to the magazine. Whilst every effort has been made to ensure accuracy of the content, the publishers of European Energy Innovation accept no responsibility for errors or omissions.

European Energy Innovation is published by:
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Chorleywood
Hertfordshire WD3 5NQ
United Kingdom

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Design & Production
RayHeathDesign.com

Website design
pulseart.co.uk

Print
The Magazine Printing Company, Enfield, Middlesex, United Kingdom

Foreword

Welcome to the Summer issue of EEI, proud media partners of this year's EUSEW. This event, "the biggest European conference dedicated to renewables and efficient energy use in Europe", will examine sustainable energy issues, debate new policy developments, and explore best practices and ideas.

We are particularly pleased that Dominique Ristori discusses the importance of EUSEW before reviewing the legislative programme that has ushered in the biggest EU energy policy reform for a decade, bringing about about, amongst other initiatives, the Clean Energy package and individual Member States' NECPs. These new rules demonstrate ambition: new targets for final energy consumption and energy efficiency; and for interconnectivity. There are new rules governing the electricity market; and a new strategy for carbon neutrality by the middle of the century. Underscoring this ambition, M. Ristori reveals that the Commission aims to increase spending on research and innovation by 25% over the next budget, and argues that this Commission has set the most advanced legislative framework in support of clean energy. Echoing this theme, Lieve Wierinck, and Lydia Peeters offer the Belgian perspective on innovation within the EU Energy Union: last winter, minds here were concentrated by an interruption of nuclear generation. One Belgian approach is the Interfederal Energy Pact, which seeks to manage the energy transition and is backed by an ambitious innovation strategy, particularly with solar power, and new investment in labour. Meanwhile, newly re-elected Miriam Dalli MEP reminds us that decarbonisation of Europe's roads is far from "an unachievable utopia".

Rannveig van Iterson and Simon Wolf explore deep decarbonisatin of the steel, cement, plastics and ammonia sectors. They first illustrate why over 80% of these emissions have been considered "hard to abate" before discussing how new technologies applied within the framework of the Commission's 2018 "Clean Planet for All" might together make a net zero Europe feasible by 2050. They make in important suggestion for the forthcoming Commission – a Vice President for Industrial Strategy, who could ensure sufficient legislative teeth.

Monica Frassoni contends that "The biggest innovation in energy is efficiency" She reminds us that the last decade saw an unprecedented increase in awareness of energy efficiency, and brought about a raft of energy efficiency measure that were central to the Clean Energy package. She then sets out the importance of energy efficiency in achieving the Paris goals: 76% of the European GHG reductions required to keep temperature increases below 1.5°C must come this way.

But all this is to some extent ignoring the 'elephant in the room'. As an exercise in democracy, commentators might applaud the fact that voter turnout at the recent elections was the highest for 20 years. But the Grand Coalition in the EU Parliament is in retreat, and a confused picture is emerging from Germany, France and Italy, all of which threatens to turn the issue of Brexit and a new UK Prime Minister into something of a political sideshow – no matter its economic significance to the bloc.

But sadly that debate itself threatens to deflect our attention away from an arguably even bigger issue. Recent climate data – including that from Antarctica – is far from encouraging, so let us all work, starting this month, to bring the optimism and ambition shown by M. Ristori to bear at EUSEW – and beyond.

...and there is much, much more for you to read inside.

Michael Edmund
Editor

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Clean Energy for All Europeans – an important step for enabling the clean energy transition

By Dominique Ristori (pictured), Director-General for Energy, European Commission

As we approach the 14th edition of the EU Sustainable Energy Week (EUSEW), this is a good moment to remind ourselves of what an important part of the calendar this forum has become as the flagship annual event for those working to build a secure energy future for Europe. Bringing together public authorities, private companies, NGOs and others, it provides a vital platform for catching up with the latest advances, comparing notes and strengthening contacts within the sector. Through the various activities and events, including the Policy Conference, Energy Days, the Sustainable Energy Awards and the Networking Village, EUSEW highlights the successes and the challenges of the clean energy transition that is taking place across Europe.

As this will be the last EUSEW under this Commission mandate, it is also a good moment to take stock. In this article, I would therefore like to highlight the areas in which we have made progress, but also take the opportunity to underline that there is far more to be done in future. While fully recognising the important progress we have made in many areas, such as low carbon mobility and revisions to the Emissions Trading System, allow me to centre my thoughts around energy policy issues.

Last month we were able to finalise the biggest EU energy policy reform for 10 years, rewriting the policy rulebook through what we call the Clean Energy for All Europeans package. Based on the Commission proposals from November 2016, eight new pieces of legislation have been adopted.

By establishing a comprehensive future proof legislative framework to drive the energy transition, and by providing in this way certainty and predictability to investors, we can facilitate the necessary public and private investment to achieve this transition along the whole energy system – starting from research and innovation, to electricity generation and the better integration of renewables, cross-border infrastructure, through to end-use consumers.

In more concrete terms, the new rules outline our ambition for where we want to be by 2030. And how to meet our commitments under the Paris Agreement on fighting climate change.

We have set new, EU-wide targets for 2030 for an at least 32% renewables share in the final energy consumption and energy efficiency savings of least 32.5%. And we have also committed to achieve a level of 15% inter-connectivity by 2030 – up from 10% in 2020.

But the changes go much further than just the numbers. We have redrawn the rules for the functioning of the EU electricity market – to facilitate the integration of renewables into the grid and more broadly strengthen the internal energy market. So that our energy prices will remain affordable for our citizens and competitive for our industry, our energy technologies have a strong industrial basis in Europe and can compete in a global and growing market, and investment are based on market signals, rather than subsidy signals.

Each Member State has now drafted a National Energy & Climate Plan (NECP) to outline how it intends to reach these objectives in the period from 2021-2030. The Commission services are currently analysing these drafts, with a view to coming forward with country-specific recommendations on each draft by the end of June.

These plans also include a longer-term view, looking forward to 2050 – and each country's broad view of where they intend to be mid-century in order to achieve a carbon-neutral economy. This follows on from the Commission's Long-term Strategy "A Clean Planet for All", published last November, which outlines how Europe can lead the way to climate neutrality by investing into realistic technological solutions, empowering citizens, and aligning action in key areas such as industrial policy, finance, or research – while ensuring social fairness for a just transition.

In line with the five dimensions of the

Energy Union, these NECPs should also outline priorities for research and innovation in the next decade. I have always said that innovation is the key to link the clean energy transition with better jobs, sustainable growth and investments in Europe.

To achieve the Paris targets, the EU needs around €180 billion in extra investment every year until 2030 in energy efficiency, renewable energy, and clean transport. While the core of the investment has to come from the private sector, there is also a clear role for public investment. A well-coordinated and carefully targeted use of public funding can provide crucial links and have considerable leverage effect on private investment.

Nowhere is this more apparent than investment in research and innovation. Thanks to the highly efficient projects financed under the current EU Research and Innovation funding programme Horizon 2020, and notably through the Strategic Energy Technology (SET) Plan, only 15% of the funding for energy innovation comes from public sources. Each Euro spent on research and innovation brings much higher economic and societal return.

As the current EU budget framework (for 2014-2020) comes to an end, the Commission is keen not just to maintain these elements, but to increase them in the next budgetary period from 2021 to 2027. Furthermore, the entire EU budget aims at an overall target of 25% of expenditure supporting climate, including clean energy transition, objectives. An increase from the current level of 20%.

Negotiations for the next budgetary period are still ongoing, but I can confirm that the Commission concept is to increase the overall budget for the new Research and Innovation programme "Horizon Europe" by 25% to €100 billion – with a target of 35% of the overall budget for climate related R&I.

Another important change in Horizon Europe is the shift from a sector-approach to a system-approach in order to address challenges in a more holistic way, including a cluster for "Climate, Energy and Transport" in order to break boundaries between disciplines, sectors and policy areas. We believe that this will lead to higher impact because the real innovation in the future is likely to emerge at the inter-section of disciplines and sectors. Here the proposed budget for 'Climate, Energy and Transport' is €15 billion - an increase of around 30% compared to similar activities in Horizon 2020. And it is an approach that fits well with EUSEW: anybody who has ever participated knows that integration and cooperation across technologies, sectors and disciplines has been a key ingredient of the week.

Missions are another novelty of Horizon Europe. We will launch a limited set of impactful and highly visible missions. They will have ambitious, time-bound and achievable goals easy to communicate to the public.

Horizon Europe will also take a new and more impact-focussed approach to partnerships with both the public and private sectors. It aims at rationalising their number in line with Union policy priorities and avoid overlaps and duplication. We aim towards a simpler architecture with three levels of partnerships: co-programmed, co-funded, and institutionalised partnerships. Again, EUSEW and the inspiring people, projects and ideas it brings together will help us shaping the missions and building on the expertise that we gather, for example in the area of sustainable and smart cities.

This new approach to partnerships will have a strong impact on the SET-Plan and there is an urgent need

to use the new partnership tools in the most efficient and effective way. Despite the impressive results achieved so far through the SET plan, to be truly effective, we must ensure that every Member State pulls its weight. All efforts from Horizon 2020 and Horizon Europe will not be enough if EU Member States do not mobilise the national public funding.

To conclude, I would argue that this Commission has set the most advanced legislative framework in support to clean energy transition that is fit for the challenges ahead. With increasing public interest on combatting climate change, it is now up to the public and private sectors to invest and innovate with a view to delivering.

I am looking forward to EUSEW to discuss this with many of you!

Brussels' buildings go circular

Our traditional economic model does not seem to have a response for many complex challenges such as the depletion of natural resources, huge amounts of waste, climate change and social inequality. Several large European cities, amongst which the Brussels-Capital Region, see a solution in the circular economy. The construction sector – a significant producer of waste and user of resources – is an important player for a successful circular transition.

The policymakers in Brussels regard the linear model – that of mining-production-consumption-waste – as unsustainable and harmful for the environment. But it also makes their region heavily dependent on scarce raw materials from elsewhere.

The Brussels-Capital Region sees the need, and in it also an opportunity, to evolve towards a circular economy: one of recovering, producing, consuming and reusing. Managing the flows of goods better will make the city less dependent on external resources, and will provide answers in terms of environment, local economy and employment.

RPCE regional programme

That is why, three years ago, Brussels' politicians launched the Regional Programme for a Circular Economy (RPCE). This programme brings together different players on its territory. It contains a wide range of concrete actions. For instance the 'Be Circular' call for projects, which gives financial support and guidance to local companies for their circular initiatives.

The results so far are promising, not least in construction. This sector shows great resolve to set up innovative business models and projects. Since the start of the RPCE, 21 'circular' construction sites have been launched.

From waste to raw materials

The construction industry produces 628,000 tonnes of waste per year in Brussels. True, 91% of this is recycled and then used, for example, in foundations. But this is downcycling: the materials decrease in value. The RPCE plan strives for a shift from waste management to raw materials management, in order to maximise resource efficiency.

This can be achieved through the hierarchy of maintenance, reuse, remanufacturing and upcycling. The latter refers to the recovery and transformation of materials that are no longer used into materials with a higher quality or value. An example: Dzerostudio Architects used 'waste' from construction and renovation projects to build their 'Tomato Chili' greenhouses.

New business models, more jobs

The Brussels-Capital Region is also keen to see new business models emerge. Companies should aim to extend their products' life cycle and thus decrease the use of raw materials. They may, for example, provide products as a service, including extras such as maintenance, repair, leasing and take-back schemes. Or they may share materials, labour or buildings. This is how two adjacent construction projects in Brussels, notably Deswaef and Debatty, deployed their trainees and site installations optimally. Companies should also exchange information better, and architects and contractors work together from the design phase.

The RPCE program also foresees positive effects on employment. In the future, students and jobseekers will find and keep jobs much easier. This is because new


Tomato chili


Map Architecture & EFP

economic activities and expertise are being created, such as reversible conception, drawing up material inventories, dismantling materials and preparing them for reuse, and manufacturing new products with recovered materials.

The building as a materials bank

Rather than demolishing them too quickly, the sector could see buildings as materials banks, according to the RPCE. Maintenance and repair, re-use, overhaul and transformation are then carried out for as long as possible. Thanks to inventories and materials passports, any material could be located at any moment within the Brussels territory. Materials would be easy to dismantle and move, as each design would be adaptable and reversible.

The Horizon 2020 Buildings As Material Banks (BAMB) project promoted this new vision in the construction sector (see earlier articles in this magazine). It started in 2015, ended in February of this year and was coordinated by Brussels Environment. Six pilot projects tested reversible building design and circular building assessment tools that were developed during BAMB. This generated insights for new business models. Brussels carried out two of these pilots: the Circular Retrofit Lab (CRL) and Build Reversible In Conception (BRIC). More information on the BAMB project and tools: www.bamb2020.eu.

BRIC, CRL, Modüll 2.0

The Build Reversible in Conception (BRIC) building was designed as a materials bank. It will have three functions in three years' time. The first version was a 70m^2 office. The rebuilding of BRIC into a 130m^2 trading space finishes in June of this year. In 2020, BRIC will be transformed one last time.

BRIC is built, deconstructed and reconstructed by students of the efp training center in Brussels. The concept is adaptable and reversible; materials are easy to assemble and disassemble. And it already proved to be sustainable: in the dismantling of BRIC 1, only 3.5m^3 of waste was generated. Moreover, if each version of this building were to last 20 years, the greenhouse gas emissions would be halved.

Circular Retrofit Lab was installed in eight old student modules on the campus of the Vrije Universiteit Brussel. The VUB Architectural Engineering research group renovated the modules, which would normally have been demolished. Together with industrial partners, they developed and tested new renovation solutions based on existing products, as was the case for the partitions and façades. The reversible construction involved a higher initial investment, but will in the long term be cost-efficient, thanks to the longer life cycle of the building and its transformations.

A third inspiring example of circular practices, apart from the BAMB project, is Modüll 2.0. In this challenge, set by Brussels' professional reference centre for construction, students of various schools developed an autonomous and modular construction. Various circular objectives were tested in it, such as resource and energy use and choice of materials, as well as long-term ideas for optimising deconstruction and assembly.

Tools for professionals

To support construction professionals in their circular efforts, the Region offers several tools. The online Brussels' Sustainable Building Guide, for instance, provides tips for dismantling, reuse and recycling of construction materials (www.guidebatimentdurable.brussels), as well as information on Life Cycle Analysis and on materials choice.

Another online application, the Tool to Optimise the Total Environmental impact of Materials or TOTEM, allows to see the impact of construction and renovation projects on the environment and to choose the right materials and techniques to reduce that impact. To date, more than 1,400 people have used the tool and 240 architects have been trained to do so (www.totem-building.be). ●


Karbon'


Photo: ©Bernard Boccara

The e-mobility revolution

By Anna Lisa Boni (pictured), Secretary General, EUROCITIES

E-mobility is set to herald a small revolution in our cities. From ride sharing apps, to publicly accessible e-bikes and scooters, and increasingly electrified public transport options, e-mobility is becoming ever more evident in our daily lives. However, this leads to many challenges, as well as opportunities. With a wide variety of players in the urban mobility scene, it's more important than ever to ensure that mobility is part of a broader, sustainable, smart city strategy, and that's where city authorities are able to act.

Local mobility plans

The humble bicycle has undergone a facelift in recent years, and Milan is one of several cities leading the charge for e-bikes. Electric bikes give cities the opportunity to tackle common challenges, such as air pollution and promote more active lifestyles, while redesigning their mobility model.

Sharing Cities, an EU funded project which brings together 'lighthouse' and 'fellow' cities, and in which EUROCITIES plays a main part, has helped Milan in these endeavours. Thanks to the project, Milan has installed 7 bike sharing stations and 150 e-bikes with child seats have been made available.

Of course, one of the linchpins of the e-mobility revolution is the focus by city administrations on developing sustainable urban mobility plans. That is to say, understanding the wider urban mobility ecosystem. A move towards e-mobility often comes hand in hand with more connectivity, digitalisation and automation of transport services. Together these emerging mobility trends directly impact how cities design urban areas.

Milan has shown leadership in thinking differently about cars. It recently began piloting an e-car sharing scheme, which will gather data to better understand how such a project would best work on a larger scale. The city is also testing a sustainable last mile delivery service until December 2020 in a bid to create a low energy city district and meet its climate commitments.

Lisbon, another member of the Sharing Cities project, has a long tradition of making use of renewable energy. It has already installed many EV charging stations around the city to encourage the use of electric cars. However, when we talk about e-mobility, the source of energy is also an important aspect. Cities can do their bit, but this needs to be supported by an enabling framework at national and European levels that supports the switch to renewable energy sources.

In the meantime, cities can look at where we can already act today. Upgrading our bus fleets is one obvious area. Paris has ordered 800 electric buses to fight air pollution in the city: the biggest bus purchase of its kind in Europe. And Cologne has committed to having a fully electric bus fleet by 2030.

Many cities, like Belfast, are turning to hydrogen as a source for their sustainable mobility needs.

Of course, cities are not the only purveyors of urban mobility and many private companies are also getting in on the act. This sometimes complicates the cohesion of local mobility, with e-scooters proving a headache for some. That's because, as cities, we work in an integrated way and we want to ensure that citizens are given a full choice of mobility options, while also working towards wider societal goals such as better social inclusion, health and wellbeing and energy efficiency. With this in mind, e-mobility options need to be flexible and integrated across the public transport network.

Innovating for a sustainable future

As we move towards ever smarter cities, technological advancements are only part of the solution. To encourage innovation, and thus promote the emergence and development of new public services, cities are increasingly having to create new business models. This needs to be thought out over the long term and often involves working with private partners. As such, sustainable financing and understanding end user behaviour are crucial to the success of a project.

London's biking scheme is 100% publicly owned, which allows for better data management – in order to ensure things like better road safety – and, as it generates revenue, the city is able to reinvest this money into the service.

Following a citizen-focussed planning process, Budapest is trialling a mobility point in its St. Gellert neighbourhood, which brings together several modes of transport and mobility services in one location, encouraging multimodality and more active lifestyles. Because having low-emission vehicles was important to the city authority, this trial includes e-vehicles. By testing this and other initiatives in its Cities-4-People project, the city is also gaining experience in collaborating with micromobility providers.

Cities are the right size for testing innovative solutions like these. Across Europe, there are many such promising city-led business models, and further efforts should be made to publicise and disseminate the findings of research and innovation projects – both EU-funded and otherwise – that could then be adopted by other cities or help shape national and European level legislation.

Revolutions take planning, or at least plotting, and we need to plot a course to deliver sustainable mobility within Europe. E-mobility comes with its own set of challenges and opportunities, but by sharing knowledge through networks like EUROCITIES and working with different partners, we can find the right solutions. A sustainable future is within sight. Now bring me that horizon.

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European cities driving electrification: challenges and opportunities

By Maria-Angeliki Evliati, Project Manager, City of Stockholm, leading on work in the CIVITAS ECCENTRIC project related to the uptake of clean vehicles

Cutting emissions from road transport and improving air quality is increasingly central to the local political agenda across Europe. Although the path towards electrification is anything but obstacle-free, cities have an excellent opportunity to take the lead, inspire and facilitate this transition. Under the CIVITAS ECCENTRIC project, the cities of Madrid, Munich, Stockholm and Turku have been testing electric vehicles (EVs), emerging infrastructure, new processes and business models since 2016.

DEPLOYING CHARGING INFRASTRUCTURE

Whilst there is agreement that charging infrastructure is crucial for electrification, there is no one answer as to where chargers should be placed in a city in order to accommodate users' various needs. The ratio of home-public charging is widely discussed. In Stockholm, where home charging is the primary focus, the city has conducted an information campaign for single and multifamily houses. Access to public charging infrastructure, both on- and off-street, is a political target which should also increase visibility and the daily range of the vehicle. Stockholm's business model for on-street charging is based on access rights agreements, where utility companies set up and operate charging on public land. In contrast to Stockholm, Madrid does not actively promote on-street charging in the inner city in order to avoid lock-in effects through reserving public space for parking. Existing on-street charging spots run by private operators are currently being upgraded from normal to fast. Madrid invests primarily in off-street charging in municipal car parks and petrol stations.

TEST FLEETS CAN ENABLE THE TRANSITION

To facilitate the transition to EVs, future EV drivers need to experience driving and charging themselves. Test users can also give valuable feedback to the car industry on vehicle and charging functionality and to policymakers on local and national policies and instruments for e-mobility. Municipal employees in Madrid and Turku now have access to EVs and light EVs procured in the municipal fleet; tradesmen and delivery companies are testing electric vans in Stockholm; and efforts are being made to reduce charging times in Munich by testing a light EV with a battery swapping system. As micro-mobility services appear in most European cities, Munich is also carrying out a study with users of free-floating scooters.

CHALLENGES AND OPPORTUNITIES

Testing new technology and processes has not come without obstacles. Existing legal frameworks do not foresee EVs, and the role of city administrations are often not clearly described. Moreover, counteracting strategies and incentives for EV deployment are not a rare case across Europe. However, users demonstrate strong interest and curiosity to test EVs and private companies are technologically ready. Cities have in this context a prime opportunity to lead the way by interpreting local legislation, identifying suitable business models, acting as impartial sources of information, and by boosting the EV market through procurement. Cities can use those grey zones in a way that enables them to realise their environmental vision and creates precedents for others to follow.

CIVITAS ECCENTRIC, alongside the other CIVITAS Living Lab projects DESTINATIONS and PORTIS, is organising a session during the EUSEW Policy Conference in Brussels on 18 June. This will demonstrate how they and their 180 sustainable mobility measures are helping to shape Europe's sustainable energy future. All projects fall under the CIVITAS Initiative, one of the European Commission's main vehicles for promoting sustainable urban mobility.

Towards a European Energy Shield

By Michel Derdevet, Secretary General at Enedis and Professor at Sciences Po Paris and the College of Europe in Bruges

The energy transition is not just about CO_2 released into the atmosphere. The fight against global warming must be accompanied by a social support that is worthy of the name. This is a crucial continental challenge for which Europe itself is the only relevant area, as Member States cannot resolve it individually.

Between 1990 and today, Europe's dependence on energy imports has risen from 44.2% of its gross energy consumption to 53.6%. With a price per barrel fluctuating between US$52 and US$84 last year, the European Union spends more than €300 billion per year on its supply of CO_2-emitting fossil fuels (coal, oil, gas), which it does not have (or has very little of) in its subsoil. Oil and gas are currently used by a large majority of the 500 million Europeans as fuel for travelling and heating.

Reducing these massive historical energy imports comes under the broad objective of achieving energy independence and sovereignty, of fighting global warming, of reducing Europe's 'carbon footprint', and above all of protecting Europeans in a situation of energy poverty.

And yet, energy poverty remains a blind spot for the Energy Union. The establishment in January 2018 of the EU Energy Poverty Observatory has not, for the time being, given rise to a European definition of energy poverty. This in turn means that it is not possible to produce an exact inventory or to develop a joint action in this area.

European directives for opening up energy markets have not really made it possible to keep prices down. The creation of a European energy shield would be the most appropriate tool for a Europe that protects its citizens, according to their wishes.

This mechanism would require a common definition of energy poverty, as well as a European Energy Solidarity Fund, fuelled by a consistent "flagging" of European Fund for Strategic Investments (EFSI) resources to support all the initiatives of those at the front line in the fight against energy poverty, including operators and local authorities. The shield goes hand in hand with a real carbon price established at Europe's borders, which would complement the existing carbon market via its application to imported fossil fuels and to the carbon content of products

imported by Europeans to avoid environmental dumping.

At a time when the United States is stepping back from the Paris Agreement and when China's environmental initiatives have ulterior economic motives, an EU border carbon tax would finally restore the virtuous circle: a relocation of European industry that takes better account of the environment.

Much is at stake. Not least, preserving our planet and enabling European citizens to reconnect with the European project.

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The biggest innovation in energy is efficiency

By Monica Frassoni (pictured), President, European Alliance to Save Energy

Our focus on measuring GDP growth has trapped us in a linear view of society. Long term quality of life needs to become the most important measure of global success. With greenhouse-gas emissions increasingly a constraint on current and future improvements in prosperity, we need to become much smarter and more resource efficient.

An energy efficient Europe will foster competitiveness and growth through innovation but also large scale implementation of existing technologies in a range of sectors, each of these contributing to the prosperity, health and wellbeing of Europe's citizens.

Energy efficiency improvements across all sectors are key to arriving at a climate neutral world by 2050.

The last decade saw an unprecedented increase in awareness of the multiple benefits of energy efficiency. As a result of this, in November 2016 the European Commission proposed making energy efficiency central to a package of legislation known as Clean Energy for All Europeans. Between 2018 and 2019, several pieces of legislation aiming at improving energy efficiency were adopted: the Energy Efficiency Directive (EED), the Governance of the Energy Union Regulation, the Energy Performance of Buildings Directive (EPBD) and the Internal Market for Electricity Directive and Regulation.

Over the next few years national governments, the Commission, local authorities, businesses, civil society and other stakeholders will have to

work together to fully implement these new laws.

The many benefits of energy efficiency in a climate neutral world

Energy savings are not only crucial for the transition to a decarbonised economy. They also offer many long-term benefits to offset costs associated with efficiency improvement. Investing in energy efficiency simply makes economic sense.

On average, every €1 invested in energy efficiency saves €3, over the lifespan of a technology. This means that energy efficiency is the most cost-effective way to tackle climate change.

“On average, every €1 invested in energy efficiency saves €3, over the lifespan of a technology. This means that energy efficiency is the most cost-effective way to tackle climate change.”

The multiple benefits of energy efficiency include economic growth, increased competitiveness, job creation, healthier population and ecosystems, clean air and water, alleviation of energy poverty, and energy security. These benefits, combined with an increased use of renewables, simultaneously address the major societal, economic and environmental challenges facing the EU today.

Energy efficiency and the 1.5°C goal

Climate change is defining our era. If we do not take bold action, we risk missing the time where we can avoid the disastrous consequences of climate change, for people and for the natural systems that support us all. We are at a defining moment.

Energy efficiency is key to achieving the goals set out in the Paris Agreement on climate change and related greenhouse-gas emission reductions. According to the International Energy Agency (IEA), 76% of the European greenhouse gas emission reductions required to keep temperature increases below 1.5°C must come from energy efficiency.

In other words, without implementing bold energy efficiency policies, it will be impossible to reach Europe’s international commitments, maintain Europe’s global climate leadership, and prove the business case for climate change mitigation.

In its Communication “A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy”, the European Commission said that energy efficiency measures should play a central role in reaching net zero GHG emissions by 2050, reducing energy consumption by as much as half compared to 2005. In order to do so, Energy Efficiency First has to be used across a fast-changing energy system, as the best way to decarbonise our economies.

Europe’s energy landscape is indeed going through profound changes. These are, driven by digitalisation, an increasing share of renewable energy, distributed generation, citizens’ engagement (the creation of “prosumers”), electrification, storage, and market integration on both national and European level.

During the next political cycle we have to build a broad alliance of progressive forces, working together to decarbonise society in the interest of citizens and the economy. We have to embrace the digital revolution to deliver energy at the right time, in the right place and at the lowest cost. This will enable consumers to optimise and monetise their energy resources on a peer-to-peer marketplace. We have to unlock the potential for energy savings and carbon-footprint reduction that lies in the EU buildings stock.

We have to promote energy efficiency and renewables working together to provide over 90% of the energy related CO_2 emission reductions needed under the Paris Agreement. And we have to unleash energy efficiency improvements in high potential sectors, including through legislative incentives for saving water and promote the water energy nexus across policies.

We need to act now. People, governments and businesses must work together to realise the full potential of energy savings across all industrial sectors, regions and cities. This will allow us to reap the social, economic and environmental benefits of energy efficiency.

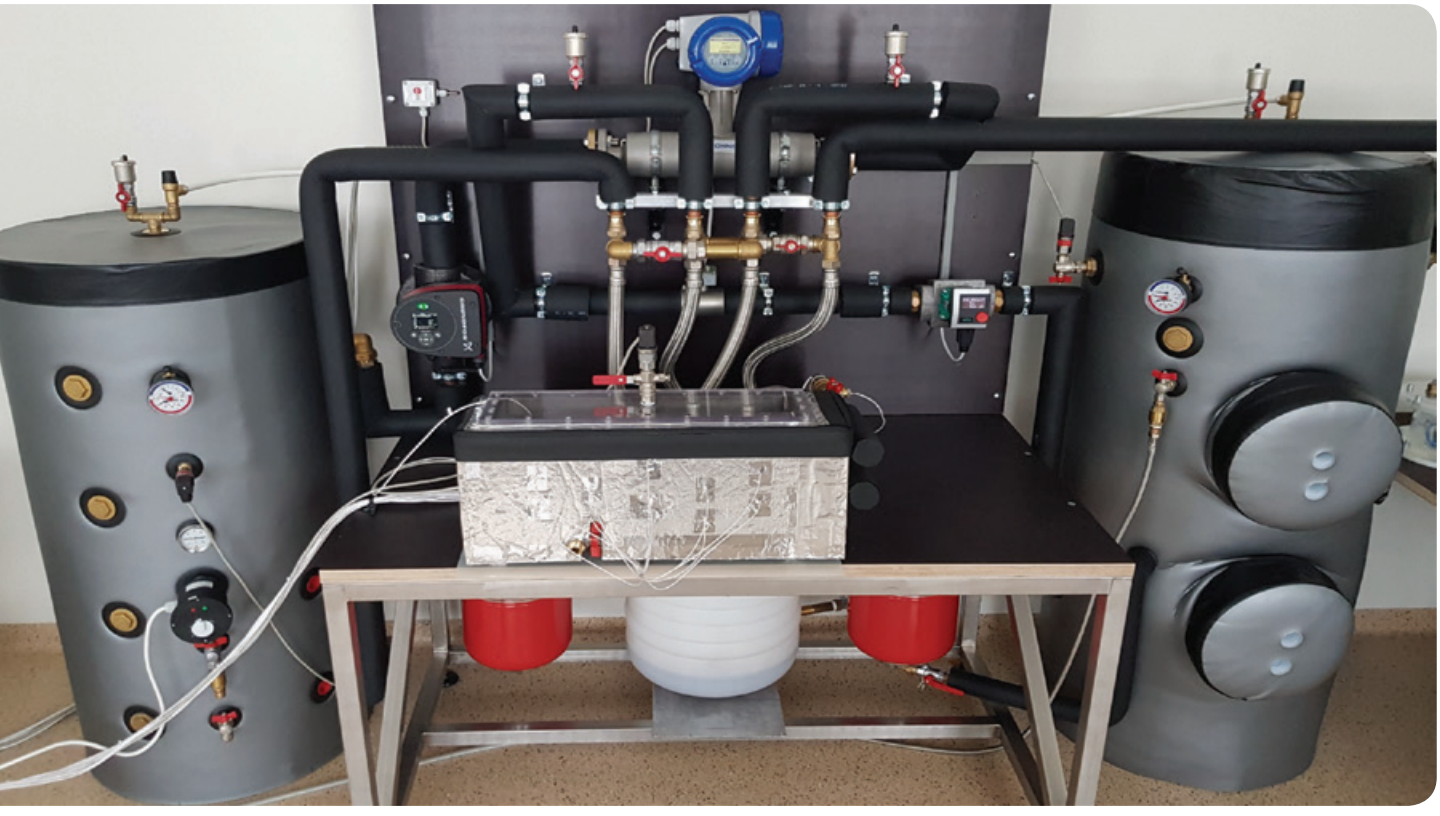
SUSPIRE project creates a new technology to harvest and commercialize the residual energy of process industries

SUSPIRE project's target is to create an effective integrated energy recovery system (equipment & methodology) as well as a commercialization framework to save 20% of the global energy consumption in the PRECICAST BILBAO (PCB) investment casting company.

Process industry companies require/consume a significant amount of energy, but most of it gets lost during the different transformation phases. To avoid this loss and to gain efficiency, SusPIRE project's international consortium is working on an energy recovery system which, combined with the manufacturing process of energy intensive companies, will recover energy from the different heat streams increasing existing energy recovery rates.

Currently, a demonstrator of the project is being carried out in the PRECICAST BILBAO (also PCB) precision casting company (Spain), where the project consortium aims at

Advanced design and preliminary testing of low temperature heat exchanger for released steam in boilerclaves



saving 20% of the global energy consumption rates. The results of the project will be applicable to other energy intensive manufacturing companies at international level. As explained by Jordi Hernando, project coordinator from PCB "sustainability is a challenge for process industry to gain competitiveness in a global market and develop symbiotic capabilities with society".

During the project, by means of advanced simulation techniques, a general architecture has been designed for the whole plant coping with all existing types of residual energy streams. As a result, a new generation of dual heat exchangers with high energy recovery yield has been born. Dual heat exchangers provide a double functionality: they can exchange and store heat at the same time so existing mismatches between energy generation and demand can be encompassed.

An innovative design and an advanced data management system to save energy

Coming to another design level, the heat exchange equipment benefits from the latest developments in Heat Transfer Fluids (HTF), and more specifically, in silicon-based fluids. Syltherm 800, commercialized by DOW, that can withstand temperatures up to 450˚C without significant degradation, is an example of this product category.

Also, Phase Change Materials (PCM) have been used during the project for energy storage at two temperature levels. For high temperature values, H190 inorganic PCM has been applied (approximately 190˚C melting point) while RT82 organic PCM is used for lower temperatures (approximately 80˚C melting point).

Finally, a Borehole Thermal Energy Storage System (BTES) has been built up in the plant. This equipment has the specific support of a heat pump and gathers all the low temperature residual heat streams coming from refrigeration units of different equipment (compressors, induction furnaces and cooling systems) and the in-cascade residual heat coming from the high temperature energy recovery circuit.

Among the main achievements reached up to date, an advanced data management system that encompasses optimal manufacturing and energy consumption has been created to make a more efficient use of energy. As explained by Fernando Santos, researcher at IK4-AZTERLAN and technical coordinator of the SUSPIRE project, "we have created a software to control the key variables and key indicators that allow us to achieve the best results in energy efficiency without disturbing the manufacturing process or affecting product quality".

Low temperature energy recovery system supported in a Borehole Thermal Energy System and a heat pump

The energy stored at 190˚C is used for wax melting and steam generation for etching baths and remaining energy is stored in the ground whereas energy stored at 80ºC is used for retro heating of water going into a boilerclave. The low temperature energy supplied by the BTES is used for building heating and hot water for workers. For the remaining excess of heat a contract will be subscribed with local authorities to supply heat to the sports center next to the factory.

SUSPIRE project is funded by European Union's H2020 program for research, technological development and demonstration under grant agreement No. 680169. H2020-EE-2014-2015/H2020-EE-2015-1-PPP.

Hydrogen: enabling sectoral integration

By Jorgo Chatzimarkakis, Secretary General, Hydrogen Europe

Hydrogen is an energy carrier, a fuel and a feedstock, which can reduce greenhouse gases emissions if produced adequately. Likewise, hydrogen can strengthen energy independence and mitigate the challenges posed by variability and intermittency of renewable energy systems as it offers a clean, sustainable, and flexible option to convert renewable electricity into a chemical energy carrier. As such it can be used in mobility, heat and industrial applications. As the "gaseous form of electricity", it is an enabler for sectoral integration, which allows the transmission of renewables into the different sectors. Hydrogen is indeed a key component of the future of energy systems that will accelerate the transition to a carbon-neutral system. It also presents opportunities in terms of job creation, technological leadership, and wider environmental protection for Europe.

The hydrogen economy is already a hundred billion-dollar market worldwide. It is today mainly used for the production of fuels (50% of the market), fertilizers (43%) and various industrial processes (6%) such as the production of glass, iron, as well as various food products such as margarine. Other uses of hydrogen exist but are still marginal on a global scale with 1% of the market:

- the propulsion of vehicles - cars, buses, trains, boats;
- the production of electricity and heat for commercial and residential use;
- renewable energy storage in the form of hydrogen, or substitution of natural gas with hydrogen in industrial and domestic applications.

These uses are, therefore, likely to grow.

The ability of hydrogen to access and integrate each sector of the energy system opens up the opportunity for deploying and utilising renewables to a much greater extent. Whereas electricity derived from renewables provides the power sector with a profound decarbonisation pathway albeit limited by the power grid, the heat and mobility sectors as well as industry do not yet have decarbonisation pathways of equivalent significance. Hydrogen technologies in a power system integrating high penetration of Renewable Energy Sources (RES) can operate throughout long periods of non-consumption-oriented production of renewable energy by feeding hydrogen into one or more energy sinks (e.g.: the gas grid, the storage tanks of hydrogen refuelling stations, salt caverns). Stored hydrogen can be used on various timescales for satisfying demands for heat, transport, power or industry achieving high utilisation and absorption of energy. The versatility of hydrogen enables these sectors to be integrated and to contribute to Europe's energy transition.

"**Sectoral integration** means the integration of several sectors such as the power, transport, agriculture, the energy-intensive industries and/or the heating and cooling sectors via the use of energy carriers such as hydrogen."

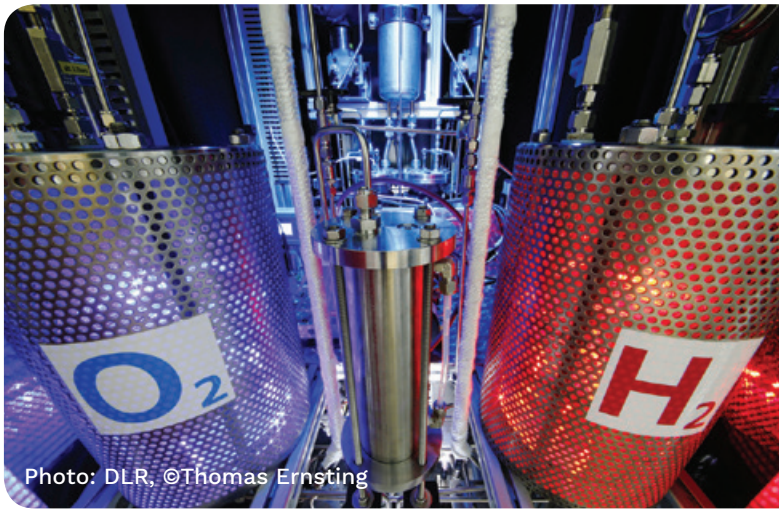


Photo: DLR, ©Thomas Ernsting

About Hydrogen Europe

Hydrogen Europe is the European association representing the interest of the hydrogen and fuel cell industry and its stakeholders. We promote Hydrogen as the enabler of a zero-emission society. With more than 110 companies, 70 research organisations and 16 national associations as members, our association encompasses the entire value chain of the European Hydrogen and fuel cell ecosystem collaborating in the Fuel Cell Hydrogen Joint Undertaking. We are a Brussels-based association fostering knowledge and pushing for fact-based policy making ensuring that the European regulatory framework enables the role of Hydrogen in our society. For more information, please visit www.hydrogeneurope.eu and follow us on Twitter @H2Europe!

The Covenant of Mayors
A key partner to design policies from the bottom up

By Dr. Eckart Würzner, Mayor of Heidelberg, Member of the EU Covenant of Mayors Board

The energy transition is well underway but it is not going fast enough. Scientists, experts and policymakers all agree: we need to act quickly if we want to meet the objectives set with the Paris Agreement.

More than 200 mayors from 30 countries recently sent a joint letter to EU leaders asking for far greater ambition in cutting carbon emissions. The letter calls for a peak in emissions by next year, more than halving emissions by 2030 and a net zero EU by 2050.

How do we get there?

Cities are key to the success of the energy transition in Europe. They are leading by example, driving societal change through decentralised, renewable power production and by reducing the energy needs of our society.

Many cities have committed, by joining the Covenant of Mayors, to achieving and even going beyond the European Union climate and energy targets.

The Covenant of Mayors for Climate and Energy in Europe

As part of the European Covenant of Mayors movement, cities and towns are taking energy and climate action to secure a better future for their citizens.

Launched in 2008, it now gathers 8,000+ local and regional authorities across Europe.

Since then, the Covenant signatories have stepped up their ambition: cities and towns joining the European Covenant of Mayors pledge to reduce their CO_2 emission by 40% by 2030, and to implement local actions aimed at increasing their resilience to climate change and tackling energy poverty.

> *Many cities have committed, by joining the Covenant of Mayors, to achieving and even going beyond the European Union climate and energy targets.*

For example, with its newest district Bahnstadt, Heidelberg wanted to visualise the city of the future. Passive houses, services in close proximities, cultural spaces but also a district heating running only on renewable energy are making it one of the most ambitious urban development project in Germany.

An inclusive partnership

The new forms of governance cities are setting-up locally to bring together citizens, SMEs and other stakeholders, are delivering the necessary transition to more liveable cities.

That should inspire the cooperation between other levels of governments, as recently declared during the International Conference on Climate Action, which took place in Heidelberg at the end of May. We need a new partnership including states, cities and regions as well as other relevant actors, to achieve sustainable and climate-resilient growth and development, delivering a better quality of life for all.

Bottom up approach to shape Europe's energy future

This is what we are trying to set-up, together with my peers of the Board of the Covenant of Mayors. Convinced that the Covenant of Mayors holds an incredible, although still untapped potential, our Board engage into dialogue with the EU institutions, to help design energy and climate policies from the bottom-up, thus ensuring Europe achieves climate-neutrality by 2050.

Supporting cities in energy planning – capacity building of local authorities in six European regions

Cities play a key role in fighting against climate change. Local authorities have the power to influence climate issues, however often lack the capacity to recognise challenges, opportunities and deliver solution. This is particularly true for small- and medium sized local authorities which face several challenges when it comes to energy planning and implementation.

Four years ago different authorities –regional development agencies, regions, research institutes– from 6 EU regions (Italy, Spain, Romania, Croatia, Hungary and Greece) decided to empower local and regional authorities (policy makers and public officers) of each region involved to shape sustainable energy plans coherent with the European climate and energy policies. The initiative received funding from the HORIZON 2020 Programme, which is the most important financial instrument to support research and innovation in the European Union.

TARGETED CAPACITY BUILDING OF LOCAL AUTHORITIES

The main idea was to involve local municipalities and regional authorities in a sound transnational exchange and capacity building activities. The transnational exchange programme was designed to enable policy makers and public officers involved to learn from each other's experiences and adapt effective responses to the major energy challenges. Based on the transnational exchange a capacity building programme was elaborated, consisting of capacity building workshops, consultations and series of thematic webinars aiming at defining a Sustainable Energy & Climate Action Plan (SECAP) or updating the existing ones. In the framework of the programme several tools were elaborated in order to improve local authorities' energy planning skills. First of all, local authorities need to be able to access data, as well as to develop skills in order to analyse and assess data. It is also important to be able to identify relevant and necessary actions and forecast the future.

The SECAPs include baseline CO_2 emission data. The Baseline Emission Inventory (BEI) quantifies the amount of CO_2 (and CO_2 equivalent) emitted due to energy consumption in the territory of the local authority. It allows the identification of the principal sources of CO_2 emissions and their respective reduction potentials. During the work a data collection template and BEI calculation tool was developed in order to facilitate the collection of the required activity data and the calculation of the figures for the estimation of the energy consumption and the triggered emissions. The methodological approach includes the completion of specific tables, which are linked with the SECAP template, so as to facilitate the development of the BEI.

Additionally collaborative and interactive "SECAP walk-through" webinars were organised dedicated to the BEI, ways of tackling the challenges, as well as to the identification of the specific mitigation actions. These were supplemented with local workshops. The region-specific content was developed by the partners, as local challenges are most likely to be solved by implementing to most suitable actions within the local context taking into consideration the local needs. All related materials are available on the EMPOWERING learning platform: https://empowering2020.eu/

Dr. Christos Tourkolias: Expert in Energy Policy Analysis, CRES, Greece

"Local energy planning is a vital process for analysing and evaluating the current conditions (local energy demand, supply and RES resources), defining of the key mitigation actions and monitoring their implementation.
All these while informing and involving citizens, addressing energy poverty and boosting sustainable entrepreneurship.

Municipal authorities should use this process and make a difference towards reducing carbon emissions and mitigating energy demand, with immedate benefit to their citizens' welfare."

Get and exchange first-hand experience from the participating regions and local authorities and benefit from the results! Join us during the Policy Conference of EUSEW 2019 or the EMPOWERING Final Conference:

POLICY CONFERENCE OF EUSEW 2019
Brussels, BELGIUM
Résidence Palace, Maelbeek
Wednesday, 19 June 2019, 11:00 – 12:30
LOCAL AUTHORITIES AS DRIVERS TO ADDRESS CLIMATE CHANGE

EMPOWERING FINAL CONFERENCE
Miskolc, HUNGARY
Castle of Diósgyőr
Tuesday, 25 June 2019, 9:00-15:30
TOWARDS SUSTAINABLE ENERGY FUTURE – EMPOWERING LOCAL AND REGIONAL AUTHORITIES

Sustainability and digitalisation go hand in hand

By Steen Schelle Jensen, Head of Product Management, Kamstrup

The obligation for EU countries to implement remotely read heat meters is a prerequisite for providing consumers with the necessary insight to encourage more energy efficient behaviour. But it is also a critical element in developing the position of district heating as a key technology to support decarbonisation and a sustainable energy future.

Ambitious EU strategy and legislation is paving the way for more district heating and an increased share of renewable energy. The two are closely linked, because district heating provides the necessary flexibility to integrate, utilise and store fluctuating energy from renewables ultimately increasing the efficiency of the entire energy system and decarbonising today's fossil-fuelled buildings. However, this remains a complex task that necessitates digitalisation of the sector.

THE DIGITAL UTILITY

With the approval of the revised EED directive, the requirement to install only remotely read smart meters for heat consumption as of October 2020 is now a reality. While its original driver is to empower consumers by making monthly consumption data available to them, there are also clear benefits to be reaped by utilities ready to embrace the digital transformation that smart metering prompts.

Once the meters are installed, the additional expense for a utility to collect daily or even hourly data is minimal compared to the added value from adopting a more holistic digitalisation approach to its entire value chain. Three overall areas stand out: daily operations, asset management and end-user involvement.

IMPROVING DAILY OPERATIONS

Smart metering provides the basis for utilities to make fact-based decisions related to the daily operations surrounding their core tasks of producing and distributing district heating.

These include optimising the production and forward temperature to run closer to the limit, detecting heat and water loss in the distribution network as well as identifying improvement opportunities for building performance and consumer behaviour decreasing the overall system efficiency. This is all also crucial to achieving the right conditions and low temperatures to integrate more renewables.

OPTIMISING ASSET MANAGEMENT

Frequent meter data – as opposed to theoretic models – enable utilities to monitor the performance of the underground pipes that make up the distribution network.

This allows better utilisation and renovation planning of existing assets so utilities can potentially avoid or defer some of the heavy investments in this area. Also, being able to compare the actual network load and capacity to its design criteria will reveal how well they match. In this way, utilities can both extend the current infrastructure's lifetime and optimise dimensioning and planning of new networks to avoid expensive oversizing.

ENHANCING END-USER INVOLVEMENT

District heating is sometimes perceived as old-fashioned, monopolistic and fossil-fuelled. Ironically, this misconception stems from the very basis for its great convenience and efficiency: one system for all that is reliable to the extent of being virtually invisible. Consequently, access to consumption data alone is unlikely to trigger significant behavioural changes.

Digitalisation can help utilities make district heating more attractive to consumers. This could include offering targeted services such as billing based on flexibility, or taking responsibility for the heat installation, but also emphasising how it e.g. utilises waste heat from local supermarkets to heat up houses in the community. In this way, end users themselves become part of the shared story of a green, flexible and sustainable energy future.

kamstrup.com

Innovation in the automotive sector - a long-term vision

By Miriam Dalli, MEP (pictured)

There are some in Europe who think that the decarbonisation of Europe's roads is some type of an unachievable utopia – dreamt about by a handful of idealistic environmental activists.

I believe it could not be further from the truth. We need to face inconvenient truths about growing vehicle emissions and degrading air quality. We need to understand the changing competitiveness landscape of the automotive sector.

Innovation is not utopia.

Innovation is the future. Innovation is something we can make happen.

The past ten years have been all about innovation in the energy sector; more and more renewables and decentralisation and decarbonisation of the electricity generation in Europe – and it happened. Science, technology with the good combination of great efforts in R&D and supportive policy measures made us achieve a real change in the energy sector. It is not a utopia any more.

Now, it is the transport sector's turn. The challenge and the main drivers are similar – if not the same. It is about putting the sector on the decarbonisation track; about new business models and new, changing consumption patterns. It is about a new, sustainable and more competitive European economy.

When I took on the negotiations of the legislative file on post 2020 CO_2 standards for cars and vans, I knew exactly what I wanted to achieve and my resolve strengthened the more I held meetings with the carmakers, technical experts, social partners, consumer organisations and environmental NGOs.

I wanted to push innovation in the European automotive sector in order to increase its future competitiveness and to strengthen decarbonisation efforts.

What we have in front of us, I believe, is the opportunity to harness a global challenge and put Europe's car manufacturing industry at the forefront before other continents take over.

Reducing CO_2 emissions in the transport sector is an opportunity on multiple fronts: safeguarding the climate and environment, reducing the impact of pollution on our health, increasing the supply of clean vehicles on the market, making them more affordable for consumers, investing in infrastructure to make the transition happen, boosting innovation and competitiveness and investing even more in our workers.

The decarbonisation of the transport sector would also be in line with the commitments under the Paris Agreement, which is key as the European Union has placed itself as "a leader" in the fight against climate change.

Such a fight cannot take place only on paper, but requires concrete and meaningful action from us all, including policy-makers, industry players, institutional stakeholders and consumers, as well.

In a perfect scenario, we would look at the life-cycle of all transport modes, including land, water and air use. However, given the scale of change that is needed, it is important to focus on transport sectors where new technologies are available on larger scale already today.

Here, we need both a technology push and a strong policy push, too.

We know – from past experiences – that in case of new technologies being a promising disruptive solution might not be enough. This is of course also true for new transport technologies.

The players in the field of e-mobility are often separated in opposing camps with great market power. Additionally, old business models are being challenged by a new way of thinking.

I believe that regulation and policy-makers can make a real difference here. They have an important job in this process. Regulation gives clarity and adds trust, which is key for success. In the upcoming years, it is about bringing the technology world and regulation together.

I can't emphasise enough that EU decision-making has already proved that it can make the positive link towards decarbonisation between industry and society. It is happening in the energy sector. What we want now is to transfer this political will, experience and knowledge to making this happen in the transport sector.

Electromobility, as one of the key solutions is already happening. We are starting to have more and more clean vehicles on the road, and electric bikes are becoming more popular. Eventually, developments in battery and fuel cell technologies are expected to result in a quicker increase in market shares for zero and low-emission vehicles in the coming years.

The EU car industry will have to consider adapting to changing demands and focus more on developing these new technologies. This will require more focus on innovation to retain competitiveness, but also, manufacturing electric batteries and chargers will provide economic and employment opportunities.

This innovation will shape our future for good – it is not only an economic opportunity Europe should not miss, but also the responsibility we have towards future generations. It is about the air they will breath and the climate they will be living in.

The decision is on us today, and the time for action is now. Decarbonising the road transport is not utopia – but an achievable reality.

We need small revolutions in policy-making, in investment decisions, in the operation of the financial markets, in energy and transport technologies. Politics need to trigger this change and policy-makers need to encourage and stimulate this new economy.

We need to rethink our economic paradigm. We need to embrace sustainability. We need to encourage and push innovation in new technologies. This is what I believed in and what I worked and fought for during this major EU legislation. ●

Interreg MED Renewable Energy Community

By Alexia Boulanger[1]; Danilo Ceh[2]; Cynthia Echave[3] and Jennifer Shaw-Taberlet[4]

Energy transition will mark the political agenda for the next years in the EU Members States, not only by the commitments achieved, but also by the urgency of Climate Change hazards. The Mediterranean Region acquires a relevant role for its vulnerability to rise of temperatures, sea level rise and scarcity of water and resources. Energy supply is one of the priorities for Europe, and most of the efforts should be oriented on renewables as the principal energy source option to support.

EU Projects represent an opportunity to be oriented on renewables and to bring new ideas and initiatives not only at scientific field but also for economy, social and territorial development. In the current programming period, the Interreg MED Programme organizes its architecture into eight Thematic Communities grouped as well in three axes: 1) Innovation; 2) Low Carbon Economy; and 3) Natural and cultural resources.

The Renewable Energy Community forms part of the Low Carbon Economy axe and it is constituted by six "Modular" Projects and one "Horizontal project, managing the community. The MED RES Community is formed by more than 115 institutions, 57 regions divided among 10 EU Member states and 3 countries from the instrument for Pre-Accession Assistance, all around the Mediterranean Sea. The common objective of the community members is fostering low-carbon strategies and energy efficiency in the MED territory and particularly, to increase the share of renewable local energy sources in the energy mix strategies and plans of MED islands and rural areas. These activities in this framework have been organized through six different projects:

LOCAL4GREEN – "LOCAL Policies for GREEN Energy", supports local authorities in the design and implementation of innovative fiscal policies, intended to promote the use of RES both in the public and private sector. These local fiscal policies are implemented in 75 pilot municipalities, located in the rural territories and islands of the MED region. (https://local4green.interreg-med.eu/).

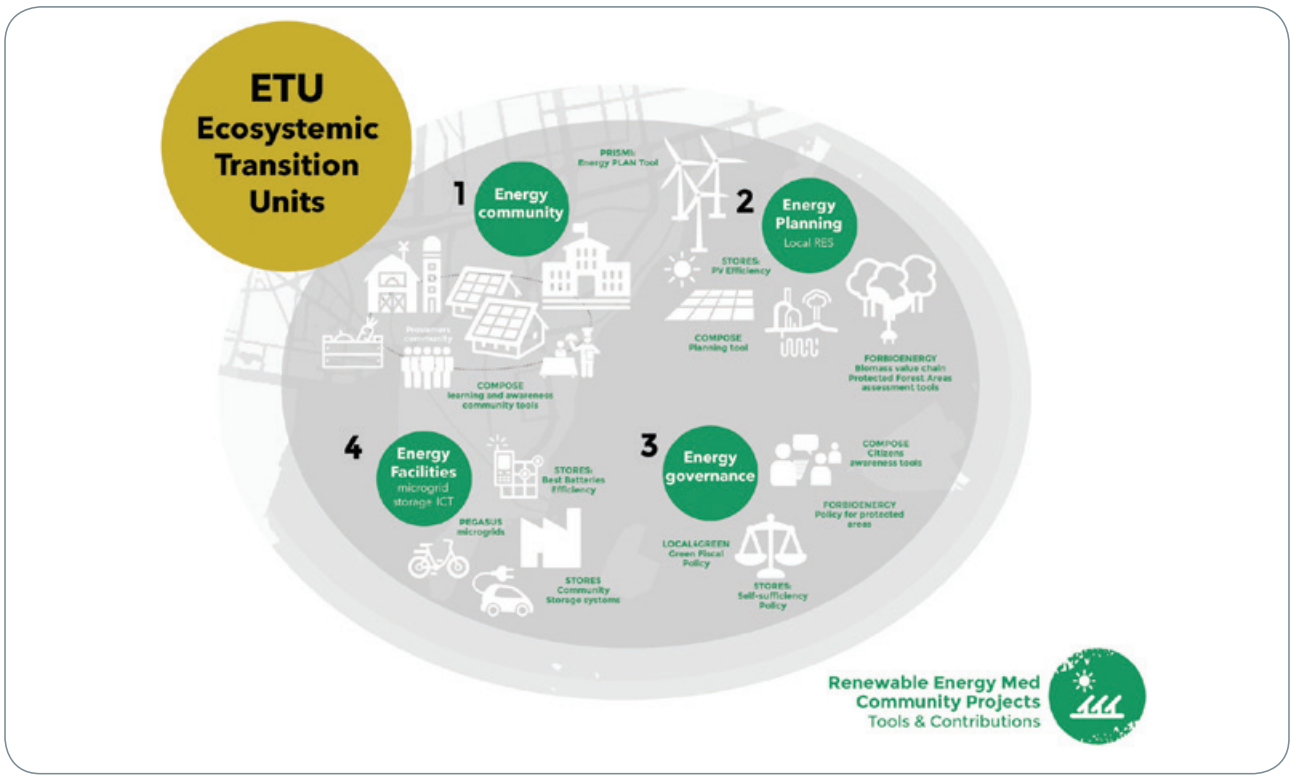
StoRES – "Promotion of higher penetration of distributed PV through storage for all", main goal is development of an optimal policy for the effective integration of photovoltaics (PV) and energy storage systems (ESS), via testing smart solutions in MED islands and rural areas. This project aims to increase PV penetration in the energy mix of islands and rural areas in the MED, by integrating PV and ESS, under an optimal market policy by removing the constraints of grid reliability and RES intermittency. (https://stores.interreg-med.eu/).

COMPOSE – "Rural Communities engaged with positive energy", contributes to an increased sustainable RES planning capacity at the decision-making and planning-expert levels. The project main objective is to promote new business models and technology development to compose green economy model thanks to the connection of local potentials to sustainable energy supply chains. By promoting the development of local business, in combination with the development of local added value chains, it provides a RES development planning synthesis model and therefore the increase of renewable energy mix in selected areas. (https://compose.interreg-med.eu/).

PRISMI – "Promoting RES integration for smart Mediterranean islands", aims to support local authorities of MED islands in planning their transition towards a low carbon and climate change resilient energy systems in a cost-effective way. To do so, PRISMI developed an integrated toolkit to assess and map RES distribution for the targeted elaboration of energy scenarios and techno-economic feasibility analysis. Moreover, a network has been established in order to power up the ambitious transition. (https://prismi.interreg-med.eu/).

PEGASUS – "Promoting Effective Generation and Sustainable Uses of electricity", is a cooperation project where a group of public and private bodies, involved in the energy sector, try to design the business model of the microgrids in the coming future power system. The goal is being achieved through the simulation, in several sites, of the microgrid behaviour and interaction of its members: consumers, prosumers (PROducer and conSUMER) and prosumers (producer, consumer and storage). (https://pegasus.interreg-med.eu/).

Forbioenergy – "Forest Bioenergy in the Protected Mediterranean Areas", develops innovative planning tools and operating procedures aimed to exploit the full potential of biomass in protected areas, by reducing the barriers that hinder the development of the bioenergy and at the same time, preserving the biodiversity of the natural areas. Project



actions are implemented through a participatory and shared process
that involves public and private key actors. (https://forbioenergy.interreg-med.eu/).

All the instruments and actions developed during the MED RES Community projects, have a high replicability potential. For that purpose, the Community proposes a common merging approach based on the complementarities of the projects results. The aim is to drive the capitalization of their tools and methodologies through a strategic planning and management tool based on an ecosystemic approach. So that is born the concept of Ecosystemic Transition Units (ETUs). An ETU should ensure a set of basic components that will allow to obtain the application to green fiscal policies and subsidies in order to accelerate the energy self-sufficiency, job creation and social development of a territory. The basic components are classified in four groups: energy community; energy planning; energy facilities and energy governance.

With the objective to take into account the needs and will of the Interreg MED local territories, the RES Community is organizing 6 regional consultations, to consensus the concept and build a common denomination of "Ecosystemic Transition Units" at MED/EU level. The consultations will include all the relevant stakeholders related to Renewable Energy and territorial planning of 6 Interreg MED countries: Spain, France, Italy, Slovenia, Greece and Bosnia-Herzegovina. The shared and consolidated results of these consultations will allow creating dedicated policy papers that will be presented at EU level.

Consequently, the creation of the ETUs, will be a fundamental tool and revitalization guideline, allowing to spread much more the projects tools, results and conclusions and to reach policy makers, local authorities and specific target groups, permitting the major inclusion of RES in the future plans and strategies. Local level and bottom-up strategies will grow and push for the enhancement of technologies and solutions based on RES in the energy plans and strategies of the MED area islands and rural areas.

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Smart Buildings: the silent champions of the clean energy transition

By Frauke Thies (pictured), Executive Director, smartEn – the European association for smart energy solutions

Today's energy world is a dynamic, emergent landscape, marked by decentralised players, and variable energy sources that raise the challenge of efficiently matching demand and supply. This reality also puts a new focus on the buildings we live and work in: from energy users with little relation to the energy grids and market realities, Smart Buildings are becoming a cornerstone of a clean energy system.

Smart Buildings as a solution, can help to balance the energy grid, create comfort and savings for consumers and prosumers, empower them to participate in the market and save energy while decarbonizing the energy system.

Smart Building Technology

Think of Smart Buildings as conductors of an orchestra: they direct the roles of each instrument and encourage all players to give their best, while ensuring a harmonious symphony.

Enabled by a smart energy management system, Smart Buildings decide how to best use energy by communicating with their various appliances and devices, such as heating/cooling, lighting, ventilation, as well as possible dedicated storage systems and on-site electricity generation from renewable sources. For example, if too much energy is available in the grid, the energy management system self-activates to charge electric vehicles or activate the heating system to store energy for later use.

If energy is needed elsewhere, smart buildings automatically feed stored energy or energy from on-site renewables like photovoltaics back into the grid. Smart Buildings thus match the needs of the building's occupants with the needs of the rest of the electricity system.

This optimisation is achieved by reacting to price signals, or by offering the Smart Building's flexibility to an aggregator (to achieve larger scales and increased reliability from pooling), that can offer residual energy to other markets. As EU markets open further to flexibility, added revenue streams for buildings will appear.

> *"As Smart Buildings increasingly interact with the energy system they can take up a significant role in system flexibility."*

Speedy transition to unleash Smart Building potential

As Smart Buildings increasingly interact with the energy system they can take up a significant role in system flexibility. The good news is that homes which use digitally controlled lighting, heating, ventilation, air conditioning, security and home appliances are set to increase from 8.5 million in 2016 to

80.6 million in 2021. Even with small adjustments, buildings can become flexible players in the energy system today.

However, clear regulations and good planning from European to municipal level are required to exploit the full potential of buildings and get them where they need to be: smart, decarbonised and efficient.

Drivers for a Smart building transition

Smart Buildings are essential players in ongoing efforts to drive the clean energy transition, increase energy efficiency and the uptake and power system integration of renewable energy sources – goals that are guided by EU-wide targets set out in the 2030 climate and energy framework and the long-term decarbonisation objectives. To achieve these goals, renovation rates need to triple and the investment of an added €100bn is needed annually until 2030[1].

To achieve this, at least three steps are needed: minimum requirements, a way of assessing progress and innovative finance.

Important elements are included in the recently revised EU Energy Performance of Buildings Directive (EPBD) that sets out recommendations with minimum requirements and drive the uptake of Smart buildings to:

- achieve a high degree of efficient and decarbonized building stock by 2050
- integrate e-mobility
- provide a renovation strategy

As well, a Smart Readiness Indicator (SRI) is under development as an assessment tool to drive the digital decarbonisation transition of the EU building stock. It should allow tenants to see what their building is capable of and help market parties, like service providers such as aggregators, easily identity the existing protentional of a building.

> *In addition to putting the current regulation into practice, effective, scalable, and affordable financing schemes are much needed.*

The SRI should measure the ability of the building to communicate in three ways:

- To itself, assessing how different building devices speak to each other to optimize and manage energy consumption
- To its occupants assessing how it transmits information about energy consumption, through a phone App for example
- To the grid in its ability to react to signals

The Smart Readiness Indicator should address the fact that the smartness of a building is usually not yet accurately reflected in the value of a building.

In addition to putting the current regulation into practice, effective, scalable, and affordable financing schemes are much needed. As flexibility markets open further in all European countries, more revenue streams from buildings will become possible, provided that investment barriers can be overcome.

Currently public support mainly circles around enabling banks to provide renovation loans, which results in an unbalanced treatment of financing sources. To facilitate a massive scale-up of renovations, new and additional types of financing schemes could enable home-owners, tenants and businesses to access necessary funding for Smart Buildings. Governments, banks, and citizens initiatives have an important role to play in driving innovative financing tools such as crowd funding and so-called energy performance contracts, that allow for different investment avenues.[1]

Smart Buildings are the way forward. Smart Buildings' demand side flexibility will permit savings and market participation for consumers, all while driving decarbonisation, renewable energy integration and the overall efficiency of our energy system. That is, so long as minimum requirements are implemented and progress assessed, backed by innovative finance.

[1] An arrangement between the client and energy services provider to improve energy productivity of buildings and supply guaranteed energy savings, all without the need for upfront capital investment.

A Call for Action in Horizon Europe on Advanced Materials for Clean Energy & Clean Mobility

Despite …

1. The role Advanced Materials play in enabling (driving costs down, increasing performance, increasing lifetime) clean energy & clean mobility technologies for the Energy Union and EU citizens' comfort & health

2. The share of Advanced Materials in the cost structure of clean energy & clean mobility technologies (beyond 50% today and trends will bring that share to 80+% making Advanced Materials a competitive factor for manufacturers of these crucial technologies)

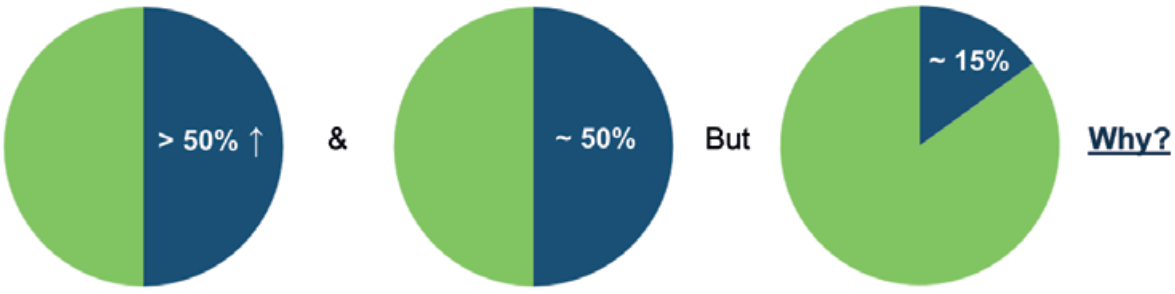
3. The need for risk-sharing policies & instruments at EU level to support the long, risky (market & technology) and capital-intensive development cycle of Advanced Materials

4. The contribution of EU-based industry of Advanced Materials to our economy (more than 30 billion euro, 500.000 jobs, 3 billion euro annual investment in R&D and facilities)

5. The share of Advanced Materials industry in EU clean energy & clean mobility jobs (at least 50%) and the importance for SMEs and start-ups to rely on a strong industry & research ecosystem to collaborate and co-innovate with

6. The excellent collaboration between EMIRI and EU DG R&I in Horizon 2020 (based on EMIRI strategic innovation roadmap called EMERIT) which led to increased EU support to Advanced Materials for clean energy & clean mobility

The share of support to Advanced Materials in total EU Horizon 2020 funding for clean energy is at a low 15% (in work programme 2018-2020) partly due to Horizon 2020 architecture & budget allocation.



Share of Advanced Materials in cost structure of clean energy & clean mobility technologies

Share of Advanced Materials industry in EU clean energy & clean mobility jobs

Share of Advanced Materials support in total EU Horizon 2020 funding (for 2018-2020) for clean energy

Moreover, potential developments regarding EU Commission's forthcoming Horizon Europe could affect negatively the EU support to Advanced Materials and other Key Enabling Technologies. This would result in an impact on European industrial leadership … Europe is not in a position to afford such a development.

IN FIELD OF CLEAN ENERGY & CLEAN MOBILITY TECHNOLOGIES, ANY DETERIORATION IN EU SUPPORT FOR INDUSTRIAL LEADERSHIP IN KEY ENABLING TECHNOLOGIES SUCH AS ADVANCED MATERIALS WILL LEAD UNDOUBTEDLY TO EU NOT DELIVERING ON ITS ENERGY UNION PROMISES:

1. **Europe not generating the much-needed economic growth & jobs for citizens who strongly supported European transition to clean energy & clean mobility technologies**

   EU is losing leadership in clean energy & clean mobility techs leading to deindustrialization and job destruction (net loss of 100.000 jobs in 2013-2016) while China & USA are thriving. Moreover, without presence in EU of a globally exporting Advanced Materials industry, the job loss would have been worse (EU-based Advanced Materials industry created 40-50.000 jobs over 2013-2016 while the downstream part of clean energy value chains lost 140-150.000 jobs). Our industry is actually slowing down EU loss of leadership in clean energy & clean mobility techs and is undoubtedly the foundation on which EU can regain global market share in the field.

2. **Europe weakening its innovation ecosystem in technologies critical to climate change mitigation**

   With China spending more than 2.5 billion euro annually on clean energy & clean mobility technologies, EU is now challenged. The situation is worsened by fragmentation, unclarity and instability of European R&I support to its ecosystem. In China, Advanced Materials are among the 10 priorities of "China Manufacturing 2025" … This is not the case in Europe.

3. **Europe replacing dependence on fossil fuels from outside EU by dependence on imported clean energy & clean mobility technologies**

   Today more than 50% of industrial players in top 10 of manufacturers of wind turbines, solar modules, batteries, … are Asian (in most cases Chinese)… Leading to EU representing today less than 15% of jobs in the field in 2016 (1.16 million jobs) while China is already at 44% (3.65 million jobs). Without EU action, EU will pass below 1.000.000 jobs in clean energy by 2020 (10% of global jobs in the field) and market opportunities of fighting climate change will not benefit EU citizens.

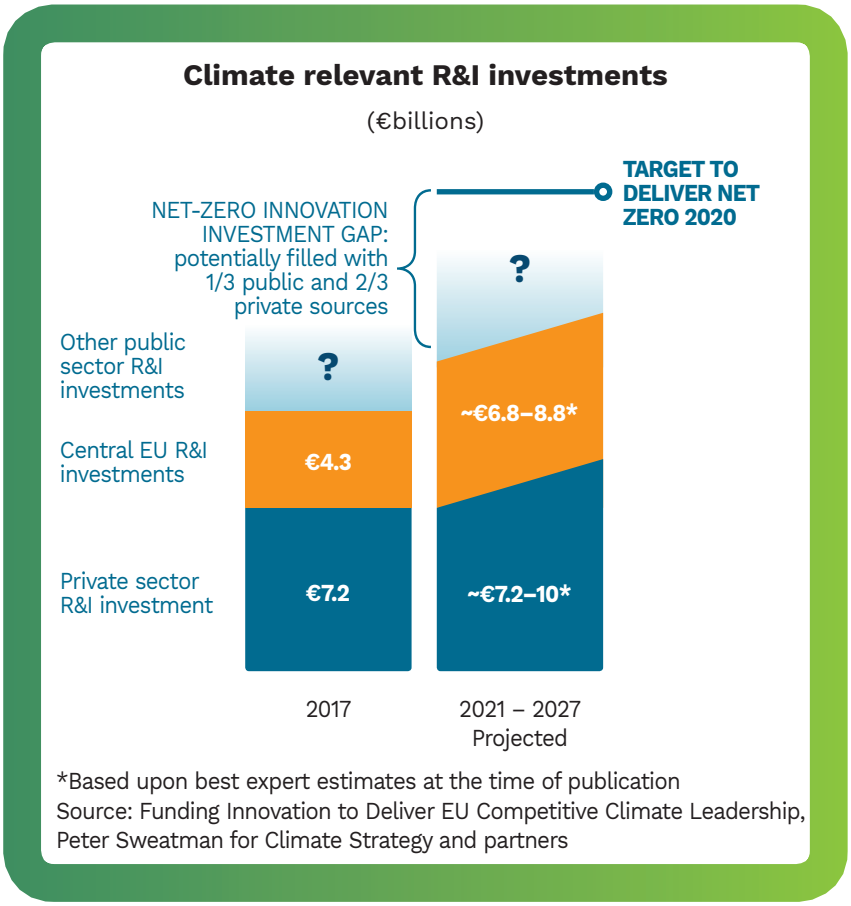
WE CALL ON EU COMMISSION, EUROPEAN PARLIAMENT AND MEMBER STATES TO FURTHER SUPPORT ADVANCED MATERIALS AND OTHER KETS AND SHOW AMBITION IN HORIZON EUROPE TO PRESERVE EUROPEAN TECHNOLOGY DEVELOPMENT LEADERSHIP, RE-INDUSTRIALIZE EU IN CLEAN ENERGY & CLEAN MOBILITY TECHNOLOGIES, DELIVER ON THE ENERGY UNION PROMISES AND PROVIDE ECONOMIC OPPORTUNITIES TO CITIZENS.

EMIRI (the Energy Materials Industrial Research Initiative) represents more than 60 organizations (industry, research, associations) active in Advanced Materials for clean energy & clean mobility technologies. The association contributes to industrial leadership of developers, producers and key users of Advanced Materials by shaping an appropriate European innovation, energy and industrial policy framework. For more information, contact Philippe JACQUES at philippe.jacques@emiri.eu, visit www.emiri.eu

A tailored framework to leverage investment in clean innovation and deliver carbon neutrality

By Adeline Rochet, European Climate Foundation

Over the past decade, the idea of carbon neutrality has gone a long way – seen as a radical utopia in the early 2010's, it is now endorsed by more and more European leaders, be it in governments or successful companies, and the European Commission sees it as a way forward in the scenarios of the Long Term Strategy for Eu decarbonization. The consensus around a net-zero EU economy in 2050 is now stronger than ever. No one challenges the fact that this will require extensive, difficult, hard to achieve transformation, and the detailed roadmap to full decarbonization is still unclear. But the fact is, more and more reports and studies demonstrate that we can do it, and suggest pathways that could be successful. The question has shifted from "whether" to "how": evidence show that the answer is with more money, adequately distributed.



All studies, all pathways have at least one thing in common: if we are to be on the right track at the end of the decade, then we need to innovate more. Widespread innovation will be required in clean technologies, but also in manufacturing process, in services, in business models, in consumption patterns, in all sectors of the economy (energy, industry, transports, buildings, agriculture...).

According to a report published this autumn,[1] the "innovation gap" between existing tools and what we need to reach carbon neutrality requires an additional 1/3 in investments every year, both from public and private sources. The need to increase investment will be particularly instrumental in the coming decade, to ensure that Europe has all the cards in hand in 2030, to then deploy and scale up innovation that will deliver the zero-carbon economy by 2050. The message of the report is clear: we need to invest more!

European Union has world class scientists and research centers, high quality infrastructures, among many assets to be a clean innovation

world leader. But fundamental research is not all, and too often, brilliant European ideas are pick up and developed and commercialized elsewhere in the world. We need the right support framework to ensure clean innovation value chains stays in Europe and benefit here. We need EU entrepreneurs and champions to sell the products and services to EU consumers and demonstrate there are solutions to the global climate challenge.

The next Research and Framework programme, Horizon Europe, sets new instruments to foster innovation. The EIC can complement the EIT with a different approach but a common goal to back innovators in their journey to profitability, the result-oriented Missions can deliver fast and concrete results if they are adequately designed. But other instruments will be of equal importance: innovators don't need more grant, they need tailored support to respond to their need, that vary between sectors and TRLs. The valley-of-death between fundamental research and market deployment is a real threat today for many entrepreneurs, and public schemes should contribute to support the risks to overcome this threat, innovation by essence comes with uncertainty and that's where public support has to make a difference. The Innovation Fund is highly expected to this extent, but structural funds and Invest EU will also play a role. In short, it's not only about the amount, but also the relevance of the instruments. To deliver, money has to be well spent.

The public framework should also facilitate the leveraging of more private money, Europe needs more risk-tolerant and patient capital to compete with other regions, to this end the dialogue between those who design the framework and those who actually make the investments has to be structured. A regular and informed discussion between relevant EU decision makers and financial actors would contribute to identify existing barriers for climate relevant investments, clarify what clean innovation is, and establish recommendations to grow the overall amount of money in the pot.

This would also be good for EU competitiveness in general, which is necessary to achieve the green transition. EU leadership doesn't lie in abundant and cheap working force, but rather is quality, high-end services and products. Sustainability will more and more be deeply part of quality, as is fairness. We want Europe to stay ahead of the game in defining the standards for climate-relevant innovation, with positive impacts for the whole value-chains. The faster Europe responds to this challenge, the greater the competitive advantage, and the bigger the benefits for the climate and the citizens.

[1] Funding Innovation to Deliver EU Competitive Climate Leadership, Peter Sweatman for .Climate Strategy and partners

TiPA: where tidal power takes off

Significant progress is being made with an innovative pan-European project which will accelerate commercialisation and reduce the cost of tidal energy production.

The EU-funded TiPA project has entered its sub-sea testing phase in the North Sea after two years of developing the new direct drive subsystem. The subsystem will be used in tidal turbines to convert energy into electricity more efficiently.

The new direct drive Power Take-Off (PTO) replaces the conventional gearbox and generator system and allows tidal energy to be turned into electricity more effectively. Testing shows the new device can significantly reduce the cost of tidal energy production.

The project is led by Nova Innovation and involves a consortium of partners including the University of Edinburgh, SKF, TU Delft, RWTH Aachen University, Siemens and Wood.

THE IMPACT OF TIPA

The TiPA project is an important part of the development pathway laid out by Nova Innovation to reduce the levelised cost of tidal energy, known as LCOE. Analysis by the University of Edinburgh showed that the project has achieved an LCOE reduction of 29%.

Nova Innovation Project Manager Seumas MacKenzie said: "These findings exceed the project target of a 20% reduction and demonstrate a significant improvement in lowering the cost of tidal energy.

"Real progress has been made since the project kicked off in 2016. In September 2018, the PTO completed 3 months of onshore testing at RWTH Aachen University, where the performance, reliability and survivability of the PTO were rigorously assessed.

"Subsea testing will be completed soon, the results of which are being analysed by the consortium to establish the next steps in the PTO design and commercialisation."

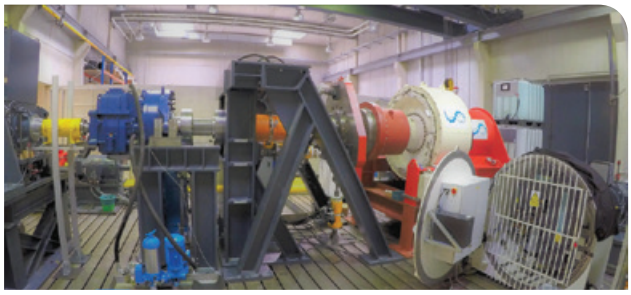
CATCHING THE TIDE

The TiPA project is an important part of Nova Innovation's wider project portfolio. As part of the separate D2T2 project, Nova is building a commercial demonstrator of a tidal turbine using direct drive technology with a target of reducing LCOE by 30%.

Additionally, through the EnFAIT project, Nova is doubling the size of its Shetland Tidal Array to six turbines. In a world first, the layout of the turbines will be re-arranged to enable array interactions and optimisation to be studied for the very first time at an operational tidal energy site.

Nova Innovation CEO Simon Forrest added: "By successfully delivering our project portfolio, Nova is proving in a real-world environment that LCOE reductions are being achieved, moving tidal energy towards commercial reality and emphasising that tidal energy, as a global mainstream renewable technology, is no longer a matter of "if" it happens, but simply "when".

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 727793.



The EnDurCrete project

New Environmental friendly and Durable conCrete, integrating industrial by-products and hybrid systems, for civil, industrial and offshore applications

MAIN GOAL

By integrating industrial by-products and hybrid systems, EnDurCrete will develop a new environmentally-friendly and durable concrete for harsh environmental applications using new types of eco-friendly Portland composite cements.

Concrete based on ordinary Portland cement has been for many years the principal structural material for building durable construction. Current state-of-the-art concrete types based on Portland cement with very high substitution by supplementary cementitious materials tend to fall behind in terms of performance and durability, which is particularly critical when applied in harsh environmental conditions. Moreover, cement production process is responisbile itself of almost ten percent of the worlds's man made CO_2 emission. Therefore, projects aimed at improving formulations and production methods to reduce CO_2 emissions, energy demand and material consumption from cement and concrete manufacturing represent key topics on the agenda of both the European construction industry and the European Commission. One of such projects is the EnDurCrete project sponsored by the EU Research and Innovation Programme Horizon 2020 and led by HeidelbergCement AG.

The EnDurCrete project aims to develop a new cost-efficient, sustainable reinforced concrete for long-lasting and added-value applications. The concept is based on the integration of novel and optimised low-clinker cement, new nano- and micro-technologies and hybrid systems ensuring enhanced durability of concrete structures with high mechanical properties, self-healing and self-monitoring capacities.

The EnDurCrete project involves 16 European partners, including industry leaders in the fields of cement and concrete production, construction companies, chemical admixture producers, universities and technological research institutes as well as service providers. The research faces several topics, from the development of new ecological low-clinker cements, innovative corrosion inhibitors, conductive fillers/fibers enhancing self-sensing capabilities of concrete, special reinforcement and self-healing solutions to the testing of durability in laboratory and on large-scale demonstrations in real environment conditions. Data collected during the testing will be further used as an input for the modelling of concrete performance and development of service life prediction

Project demo sites where technology applications will be tested

models. Furthermore, the knowledge and experience gathered by the project is supporting the preparation of novel standards for more eco-friendly cements and concretes.

Following the concrete development stage, full-scale demonstrators will be cast and placed in working sites of tunnels, ports, bridges and offshore structures, to prove the enhanced durability and the improved long-term cost efficiency of the new concrete structures in such critical applications. However, EnDurCrete is not only about developing concrete but also about pushing forward test methods and analysis tools. Advanced non-destructive continuous monitoring and testing tools and procedures will be developed and used, including technologies tuned for providing concrete with self-sensing capabilities. They are intended to complement the conventional durability testing procedures in laboratories.

Project ID: 760639
Website: www.endurcrete.eu
Video: www.youtube.com/watch?v=Jfgom15vUsg
Start date: January 2018
Duration: 42 months
Project coordinator: Arnaud Muller
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Wind potentials for EU in the context of carbon neutrality

By Wouter Nijs (pictured) with the support of Thomas Telsnig, Cristina Vázquez Hernández, Pablo Ruiz Castello and Jose Moya, Directorate C – Energy, Transport and Climate, DG Joint Research Centre, European Commission.

In the EU's 2050 long-term vision towards climate neutrality, wind onshore capacity expands by a factor 5 and wind offshore even by a factor 25. The aim of this article is to substantiate this long-term vision with knowledge from recent JRC work. Are wind potentials high enough for the projected significant deployment of wind?

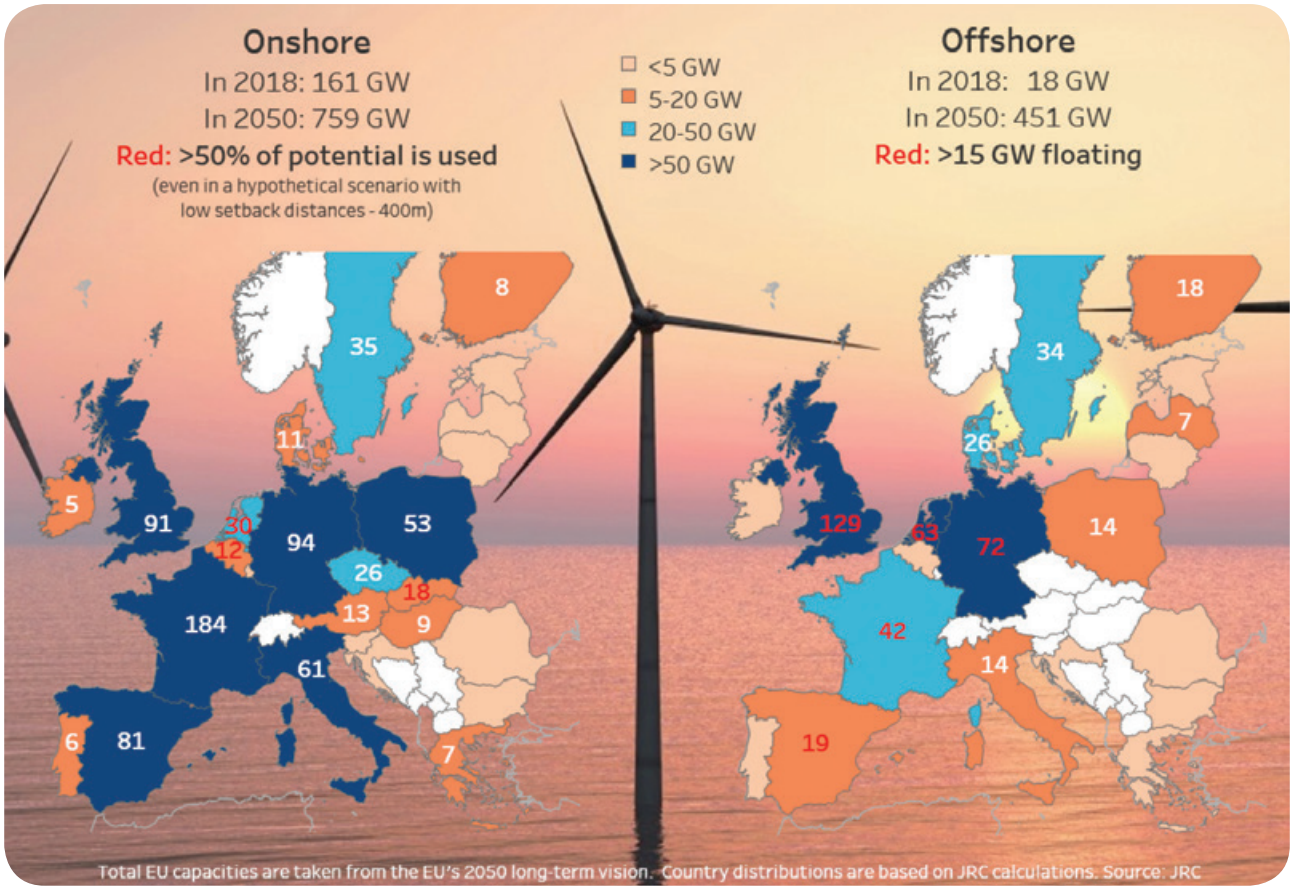
In 2017, wind power produced 11% of the electricity generated in the EU. Moreover, 2017 was the first year that wind generated more power than any other renewable category, surpassing the average power produced from hydro in the last 10 years. In 2017, the wind energy market experienced a record year in annual additions rising to 15.6GW for the EU28[1], out of which 3.2GW were offshore. On a global level, the majority of cumulative capacity installed today is located in China (35%) followed by the EU28 (30%) and the US (16%). Although the market decreased in 2018, wind still accounted for 48% of total power capacity installations, larger than any other technology.

In November 2018, the Commission presented its strategic long-term vision[2] for a prosperous, modern, competitive and climate-neutral economy by 2050. The strategy shows how Europe can lead the way to climate neutrality by investing into technological solutions such as wind energy. In the two climate neutral scenarios (1.5TECh and 1.5LIFE), wind capacity increases from 179GW in 2018 to about 1200GW by 2050. As a consequence, wind power leads power production in all decarbonisation scenarios in 2050 with a share of 51-56%. In terms of annual capacity additions, both onshore and offshore markets converge between 2030 and 2050 to over 25GW per year. About two thirds of the capacity is installed onshore: 759GW versus 451GW offshore.

But is the wind energy potential in Europe high enough to cover these needs? A recent JRC report[3] presents potential wind power generation at national and regional levels. For this study, coherent GIS-based land-restriction scenarios are developed considering setback distances and high resolution geo-spatial wind speed data covering a period of 30 years. In all potential estimates, certain land areas are excluded such as forests, NATURA2000 areas or urban surfaces. Under a reference scenario, in which floating wind turbines are not taken up, the overall wind potential in the EU is equivalent to 3 times its current electricity demand. Wind onshore contributes with 3400GW (8400TWh) and wind offshore with 350GW (1300TWh). The identified potentials are large however still lower than EEA (2009), Caglayan et al (2018) and Ryberg et al (2018) that include fewer restrictions.

The EU onshore potential is clearly larger than the projected deployment however, without floating turbines, the EU offshore potential is not sufficient. What can we conclude at country level? To answer this question, we apply the country distribution from a JRC-EU-TIMES scenario[4] to the total onshore and offshore capacities from the EU's long term vision. The results are presented in the graph. Countries with red coloured numbers reach their limits when deploying wind power at large scale.

For wind onshore, the countries coloured dark blue (>50GW) will have more capacity in 2050 than currently installed in Germany. The three countries with the highest capacity are France, Germany and the UK. In



Estimated EU wind capacity in 2050 in a carbon neutral scenario and challenges derived from wind potentials

terms of capacity still to be built the top three is: France (+168GW), the UK (+ 78GW) and Spain (+57GW). Even in a hypothetical scenario with low setback distances - 400m - three countries will need more than 50% of their wind potential: Belgium, the Netherlands and Slovakia. These countries may face high levels of land competition or increase their dependence on neighbouring countries. All other countries use less than 30% of their potential.

For wind offshore, most of the required capacity is still to be built. The three countries with the highest capacity are the UK, Germany and the Netherlands. Five countries will have a substantial capacity in deeper waters, now also including France and Spain. This would require floating technologies that today is still significantly more expensive than fixed-bottom technology.

We conclude that on the one hand, the potential of wind is very high: equivalent to 3 times EU's electricity demand. On the other hand, the significant increase in low carbon power production in carbon neutral scenarios, together with imbalances between energy intensity and wind potential, may become very challenging for some countries. The long term deployment of wind in the EU will depend on competing land uses with mainly agriculture, competing interests in sea areas and on the innovation in offshore fixed-bottom and floating technologies.

JRC developed ENSPRESO, ENergy Systems Potential Renewable Energy SOurces, an EU-28 wide, open dataset for energy models on renewable energy potentials, at national and NUTS2 levels. ENSPRESO can impact the results of any energy model by improving its analyses of the competition and complementarity of energy technologies. Specifically for wind, the output with the highest relevance for policy making is the dataset with an estimation of power production under three different restrictions scenarios. ENSPRESO is accessible from the JRC data portal https://data.jrc.ec.europa.eu/.

[1] Telsnig T, Vazquez Hernandez C, Technology Market Report - Wind Energy, European Com-mission, 2018, JRC116294
[2] A Clean Planet for all - A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy, European Commission, 2018, November
[3] JRC (2018), Wind potentials for EU and neighbouring countries, http://publications.jrc.ec.europa.eu/repository/bitstream/JRC109698/kjna29083enn_1.pdf
[4] Deployment Scenarios for Low Carbon Energy Technologies, Joint Research Centre, 2019, January.

Making the grid smarter

Worldwide we have a problem: global warming and climate change. In this regard, the European Union (EU) has decided to raise its target of energy consumption from renewable energy sources (RES) to 32% by 2030. By 2050, the EU aims to reduce greenhouse gas (GHG) emissions by at least 80% compared to 1990 levels. In this process, the power grid has been part of the problem but it is also part of the solution.

In the last few years, the appearance of renewable energy sources, distributed generation, and the advances in power electronics, and sensing and communications has led to a change on the energy paradigm (redefining the electrical networks), changing the way we understand it.

The advent of the Smart Grid is a reality, making it the future of electrical power infrastructures. With this, an important number of agents (sources, storage devices and consumers) will have intelligent interfaces allowing the regulation of the injection and extraction of power into the grid. This context will create multiple alternatives to increase the efficiency in electricity generation and consumption, to reduce energy costs and to provide a more reliable operation of electrical grids. However, it also poses new challenges into power distribution due to weather variability, load uncertainty and system coordination. A stable, reliable and secure operation of these future networks will be only possible with suitable control algorithms.

All these problems are currently addressed by INCITE by developing solutions and control strategies for the electricity grid of tomorrow.

The general objective of the research programme of INCITE, an H2020 MSCA Innovative Training Network, is to propose innovative solutions for the challenging work of controlling and designing the future electrical networks. Another goal is to create a multidisciplinary research space with a complete view of the smart grid control sector where talented young researchers can be trained through research. In other words, INCITE aims to cover the existing gap between theory and smart grid real world applications, in order to ensure the proper understanding of the novel problems arising due to the implementation of such new technologies as well as to provide with tools that cope with such new requirements.

Some of the key objectives of the research plan of INCITE are:

- To provide the Early Stage Researchers (ESRs) at the heart of the project with deep knowledge in control, optimisation, power electronics and power systems with a complete view of the real necessities of the main actors in the smart-grid sector.
- To create a multi-sectoral space where industry and academia can interact to find new and better control solutions for the future electrical networks.
- To develop high-quality tools and methodologies for the control, power management and monitoring for smart grids.

INCITE, Innovative controls for renewable source integration into smart energy systems, brings together a group of 14 PhDs and is funded by the European Union's Horizon 2020 research and innovation programme under Marie Sklodowska-Curie grant agreement 675318.

INCITE, making the grid smarter.

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RESPOND
DEMAND RESPONSE FOR ALL

Co-funded by the Horizon 2020 programme of the European Union

Towards Energy-Positive Neighborhoods with Demand Response

RESPOND will deploy and demonstrate an interoperable, cost-effective and user-centered demand response (DR) solution for energy positive neighborhoods.

Nowadays, society must be sustainable at every level, including residential buildings. To address this issue, the European Commission relies on projects like RESPOND, which aims to implement the innovative Demand Response (DR) programs in residential areas.

The DR concept can be defined as the intentional modification of normal consumption patterns by end-use customers in response to incentives from electricity grid operators. It is designed to lower electricity use at times of high wholesale market prices or when system reliability is threatened. Demand response requires consumers to either actively respond to signals from the operator or, in what may be a more appealing option, to make use of automated solutions to enter into contracts with service providers.

You may have heard of the DR concept in the industrial sector, where energy demand is high and cost savings are being sought. Moreover, this is not the only significant sector when it comes to energy demand.

Energy consumption in residential areas across Europe accounts for 40% of the total Union's energy demand. That is why the European Commission has set itself the target of reducing its energy consumption by 32.5% in 2030.

This led to projects such as RESPOND, that follow a long-term strategy for a Cleaner Planet and a more sustainable energy system for all.

The main focus of the project is the introduction of Active Residential Demand Management as a tool to contribute to a more sustainable society.

And how should we implement Active Demand Management programs in residential areas?

The aim is to go beyond the usual energy management protocols in residential areas and achieve a sustainable energy system in the long term. Although the implementation of Demand Response in the residential sector is still in its early stages, there is an enormous untapped potential. This will lead to better operational energy management, a change in consumer behavior and savings improvement.

Through the implementation of Demand Response programs, a number of initiatives that give energy consumers the opportunity to intentionally change their consumption habits can be promoted. This change in consumer behavior may be the result of energy price variation during peak demand.

As for the RESPOND Project, what exactly will the implementation of Demand Response in residential areas mean?

- Implementing cooperative demand management to maximize the use of common energy resources.
- Improve building occupants' commitment to energy demand and consumption.
- Improve the comfort of building occupants, reducing energy consumption.
- And ensuring system integration and interoperability.

That will result in energy and cost savings for stakeholders along the entire energy supply chain, and, if combined with local renewable energy production and storage, it will also lead to a significant reduction in peak demands, resulting in energy and cost savings for electricity grid operators.

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Building up EU standards on timber design

By Dr Philipp Dietsch, Team Leader Timber Structures, Chair of Timber Structures and Building Construction, Technical University of Munich, Germany.

EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

A COST network's findings on innovations in timber construction are being used to update European building standards for this climate-friendly material. Collaboration between researchers and industry participants is fostering wider use of wood-based building.

The COST Action 'Basis of Structural Timber Design – from research to standards' published comprehensive scientific evidence and harmonised construction methods for recent novelties in timber-based construction. It did so in four reports, on design basics, cross-laminated timber, connections and timber concrete composite structures. A special edition of the scientific journal Engineering Structures summarised further evidence in 21 articles by network participants.

Metropol Parasol, Sevilla by Dr Philipp Dietsch
opposite: Mjostarnet, in Brumundal, Norway by from Prof. Stefan Winter

These publications are being used to update Eurocode 5, the European standard for the design of timber structures, as part of a general revision. Action members came from 31 countries, 27 in the EU.

"We created a shared understanding of how to use these products. This is crucial for the acceptance of the revised standard," says its Chair, Dr.-Ing. Philipp Dietsch of the Technical University of Munich in Germany.

The update could make new types of timber structures possible, such as high-rise buildings, Dietsch explains. The last revision of the standards was 20 years ago. Since then, the sector has seen a raft of innovations, including cross-laminated timber, novel screwed connections and timber concrete composites.

"They have to become part of standards so engineers and companies can use them. This was a 'now or never' chance for this Action," says Dietsch.

"The publication of an agreed set of recommendations from experts representing many EU member states should facilitate early integration in design standards."

Climate-friendly construction

Part of the urgency is that the EU has ambitious targets to reduce carbon emissions by 40 % of 1990 levels by 2030 and by 80-95 % by 2050. Construction produces over a third of the EU's CO_2 emissions.

As a store of CO_2 and using less CO_2-intensive materials such as concrete and steel, timber buildings can help to reduce these emissions.

"Climate change means that interest in timber engineering is on the rise. We don't have time to duplicate research," says Dietsch.

With 30% of participants from timber construction industries, this Action has created a community that can more efficiently promote and improve construction with wood.

"We were able to strengthen the European community of timber construction specialists and establish strong bonds between industry and academia, both key factors in order to seize the opportunities for timber construction in Europe"

Already, the network has led to seven new projects, including two funded by the European Commission's H2020 programme.

These include INCEPTION which realises innovation in 3D modelling of cultural heritage and PRO-GET-ONE, Proactive synergy for Greater Efficiency On buildings' Envelopes.

Additionally, three early-stage researchers have found positions as Professor through the network.

View the Action: https://www.cost.eu/actions/FP1402

View the Network website: www.costfp1402.tum.de

All hands on the deck for a fair energy transition

By Ronan Haas (pictured), Advisor Gas to Power and Financial Regulation, Eurelectric

The journey towards a smart, energy efficient and truly sustainable society for all citizens of Europe has already started. To fully enjoy its numerous benefits, the European Union must put in place the prerequisites for a fair and inclusive transition throughout Europe. While moving on full speed on the climate agenda, Europe absolutely needs to ensure social acceptance of what the energy transition entails and recognise the different starting points European countries and regions. All necessary solutions must be put in place to support the economy and the social consequences of the energy revolution.

This objective features high in the priorities of Eurelectric's new President. During his two year mandate, Magnus Hall, CEO of Vattenfall, will continue pushing for the right frameworks enabling full decarbonisation of the electricity system and for the use of electricity in key segments of the economy in need of decarbonising, while striving for a fair, efficient and just transition. These two priorities must go hand in hand in order to deliver on the systemic transformation that citizens call for all around Europe. Last week's European elections show how much citizens aspire to a greener Europe but also fear the possible repercussions of the significant changes it entails for the European economy and society.

Recently, Meghan Richards, Director of Policy in DG Energy, took the view that the "clean transition should not

> *In the coming years, the European industrial landscape will be substantially changed, thanks to increasing investments in renewable technologies.*

be regarded as a step backwards but as a clear way to develop our economies". Today, over 4 million people are employed in the green energy sector and the numbers continue to grow thanks to the latest technological developments and rollout of renewable energy sources. For instance, in the coming years, the solar sector alone is expected to provide between 100,000 and 170,000 additional jobs to Europe.

Therefore, to be just, the transition should go beyond investing in new clean capacities. It should place workers and consumers at the centre of the debate. Establishing a broad and long-term dialogue among all stakeholders will be key to the success of the energy transition. Such initiatives have started to emerge and inspire the European debate. Ireland, for instance, has established a citizen forum, by engaging a hundred of people in a dialogue on the future development of the island.

Synergies are also needed at the European level. Since its establishment by the European Commission in 2017 the Coal Regions in Transition Platform has brought together numerous actors: European institutions, investors, NGOs, EU regions and also private companies which stand ready to contribute to this transformation. One of its central activities is the exchange of information on the use of public funds in the most effective and efficient way. While in its first stages this platform focused on compensation aspects it is now time for it to look into new opportunities in the field of green industrial development.

The European industrial landscape will be substantially changed in the coming years, thanks to increasing investments in renewable, storage and flexibility technologies. Therefore, in addition to clear goals for 2030 and 2050, a coherent investment framework is needed to provide certainty for investors. The European Investment Bank is already aligning its lending policy with the goals of the Paris Agreement. Climate change should be a priority for policy makers as well as for investors – but more certainty for them is be necessary. This is certainly key for those regions across Europe which not only have a longer road ahead of them by moving away from carbon intensive value chains, but also often face higher investment costs and barriers.

The energy sector is undergoing tremendous transformations to provide Europe with clean energy, deliver flexible capacities and strengthen networks. Beyond the power sector's commitment, ensuring a cost-effective and fair transition also requires the full engagement of customers and the definition of sound market design policies. Europe has come a long way in these questions but more challenges lie ahead to enabler better market integration across our continent.

The European Union emerged from the Coal and Steel Community, placing the energy at the core of the European construction. Since then, European Members States are joining forces to build a Clean Energy Union. The green transition has to be a positive transformation for Europe's citizens, jobs and industry - within the EU and in neighbouring countries. Clarity, coherence and ambition should support a fair transition, which is already underway.

AMPERE

AUTOMATED PHOTOVOLTAIC CELL AND MODULE INDUSTRIAL PRODUCTION TO REGAIN AND SECURE EUROPEAN RENEWABLE ENERGY MARKET

By 2030 the European Union will have to cover 27% of final energy consumption with renewable sources. In this context the AMPERE project (**A**utomated photovoltaic cell and **M**odule industrial **P**roduction to regain and secure **E**uropean **R**enewable **E**nergy market) has been conceived. Funded by the European Program H2020 with almost 15 million euro, for a total value of over 26 million euro, AMPERE aims to develop an innovative technological solution to support the competitiveness of the European photovoltaic industry and regain market shares.

Coordinated by the Italian company Enel Green Power, this international project involves 15 partners among scientific institutes and companies from 7 European countries, all with a unique worldwide experience.

AMPERE will develop a fully automated pilot line for the production of photovoltaic modules with an innovative high-efficiency: the bifacial heterojunction (HJT) module solution that provides the coupling between crystalline silicon and amorphous silicon to guarantee high performance in terms of efficiency conversion and energy productivity.

In more detail, the technical objectives of the project AMPERE will involve the production of 72-cell photovoltaic modules with over 400 watt peak power and a cell conversion efficiency of over 23%.

AMPERE aims to demonstrate the low-cost potential of innovative manufacturing approaches, deriving from low solar electricity generation costs thanks to intrinsic high efficiency and bifaciality of the HJT technology. AMPERE will contribute towards solving the global climate challenge by developing PV modules that are more efficient, have a longer life time and more reliability.

The main result of the project is the setting-up of a 200 MW full-scale automated pilot line in a production environment at the Enel Green Power's 3Sun Fab, while also preparing the next steps to a GW scale plant in Europe. Another notable key exploitable result is the LCOE reduction target of at least 15% compared to conventional PV mc-SI technology. This reduction will be achieved thanks to the intrinsic specificities of the HJT technology (low cost process, high efficiency and low temperature coefficient) and the process evolutions introduced in the project.

A major project outcome is to demonstrate the financial sustainability of PV Manufacturing plants in Europe by studying the possibility of building a big Giga fab manufacturing plant in Europe. The viability of the technology in terms of throughput, reliability, costs, efficiency, and in terms of project bankability will be demonstrated as one of the main project outputs and it will show the potential for cost and performance competitiveness of the final product.

Moreover, leveraging on the project results would be a significant achievement and will influence the PV market metric to shift from Module cost focus (cost of production of each module kWp) to LCOE, levelized cost of electricity focus (cost of generation of 1 kWh of electricity). The technology will also have strong upstream (materials and equipments) and downstream (BOS, installation, utilities, etc.) impacts on the European market. The results coming from the development of preliminary business plans for Industrial actors, technology providers and end-users, demonstrate that strong growth of the PV manufacturing sector in Europe is possible within the next few years.

The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 745601.

www.ampere-h2020.eu

High Performance Green Port Giurgiu

The partners ILR Logistica Romania (private company), Giurgiu Municipality and S.C. Administratia Zonei Libere Giurgiu (both public companies) are working on the successful realization of the EU-project „High Performance Green Port Giurgiu“. The global main objective of this EU-funded project is to transform the port of Giurgiu into the first efficient green port on the Danube.

The central part of the project is the construction of the first tri-modal logistics center on the Lower Danube with a fully covered ship berth, in which trucks, wagons and ships can be loaded and unloaded independent of the weather. This ensures a quality-assured transshipment of high-class industrial goods like steel or automotive components. A connection to the public railway and the rehabilitation of the access roads inside the port area are necessary for the usage of the logistics center. The overall project budget is about 15.5 million euros and is funded with 85 % by the European Union.

The construction phase is fully in progress. A first milestone was achieved last year with the connection of the future tri-modal logistics center to the public railway. This newly built railway track has a length of about 740 meters and had a construction period of about 7 months.

Furthermore, a cofferdam was built to protect the site from the water of the Danube and to keep it dry during the construction phase. In order to reach the proper construction level of 21 meters, the land had to be filled up with bulk material. This was necessary in order to protect the logistics center against future high water.

In 2020 operation in this most modern logistics center in Southeastern Europe will start. It offers companies a perfect logistical infrastructure. An increase of the annual capacity of the port from current 135.000 tons in 2018 to 300.000 tons in 2026 is then possible. Next to savings in transport handling and transit time, the new port will also reduce CO2 emissions and will create new jobs in the Giurgiu region.

The importance of this project for Europe was demonstrated at the last CEF conference in Bucharest in March 2019, where the CEO of ILR Logistica Romania gave an opening speech in the panel “How to make the Rhine-Danube and the Orient/East-Mid corridors fully multimodal corridors”. ●

LOGISTICA ROMANIA

PGPG STAGE II CONSTRUCTION

For more information about the project, please visit the following website:

www.ilr.com.ro/projects/high-performance-green-port-giurgiu.html

Co-financed by the European Union
Connecting Europe Facility

Advancing our cities with electromobility

By Umberto Guida, Senior Director, Knowledge and Innovation, UITP

UITP is the International Association of Public Transport. We are a passionate champion of sustainable urban mobility and as the only worldwide network to bring together all public transport stakeholders and all sustainable transport modes, we work alongside our more than 1,700 members in 100 countries to advance the global sector.

How we move around our cities is extremely important and as more people choose urban living, we must continue to advocate for the best space, access and liveability possible. Since 1885, UITP and our international members have made mobility a top priority, showing the many ways in which public transport betters our lives.

As the Senior Director of UITP's Knowledge and Innovation department I oversee an informed, passionate and innovative team who make it their priority to advance the sector on a daily basis.

Our knowledge and innovation teams work on various different tasks to do this; including managing committees and commissions, alongside our global membership, and on European research projects that focus on sector development.

With more than 50 projects ongoing, UITP has been a leading partner in a wide range of EU-funded research projects for many years, with the European Commission recognising UITP as a key interlocutor in promoting public transport stakeholders' priorities for research and innovation. In 2018, UITP was delighted to be recognised with the top ranking achieved in the Horizon 2020 official statistics. This achievement was a sign of the internationally recognised role the association plays in the field of Transport Research and Innovation. The European Commission updated their H2020 statistics for the period 2014-2017 and UITP ranked first for transport research in all of Belgium and second in Belgian NGOs for European Union funds for research with 21 projects.

It's always important to promote the work UITP and our members carry out to advance the sector and an invitation to contribute to European Energy Innovation Magazine is most welcome.

Energy, and the changes that are occurring in the field, are directly relatable to the work being undertaken by UITP. The public transport sector has undergone many changes over the past few years in modernising modes and usage to deal with climate issues and environmental impacts. The public transport sector can lead on this and UITP advocates for a better understanding of what we can do, by partnering and working with many important bodies and voices.

The challenges, obstacles and opportunities to deliver an effective electromobility system in Europe have been increasing over the years. UITP has remained at the forefront of these developments. The rise of electric buses around the world continues to develop, as electromobility advances. It's safe to say that public transport can, and does, lead the way on electromobility. Electrification is widely considered as a viable strategy for reducing oil dependency and the environmental impact of road transportation, but more needs to be done to make it a reality. Electromobility cannot be considered as a separate chapter of urban mobility. Pollution and congestion are the most burning problems of cities today and we need to think globally to tackle them both, otherwise we will get stuck in a silent and emission-free traffic jam. Increasing the share of public transport, which is already largely electrified thanks to light rail or metro, as well as relatively new electric buses, will ease congested streets and drastically reduce pollution.

The research projects carried out at UITP address these issues and the changes needed to develop.

The ELIPTIC project - Electrification of Public Transport in Cities – was a project that aimed to develop new concepts and business cases in order to optimise existing electric


Photo: © Metro De Madrid

public transport infrastructure and rolling stock. UITP was responsible for monitoring the technological concepts and dissemination of the project. Concluding one year ago with a final conference, the project analysed 20 technological concepts within 11 cities - and in three thematic pillars. ELIPTIC was a great example of working together to create new concepts that work best for the future.

At UITP, we're also working on E-LOBSTER, a project dedicated to the optimisation of the energy triangle composed by city energy grid, the Public Transport power network (metro, light rail transit) and charging station (for bus and shared cars mainly). It's another pioneering project that I know our team will make a huge success.

The ZeEUS project, also coordinated by UITP, was a flagship electromobility project that focused its findings and plans on electromobility in Europe across a number of common themes for electrified passengers cars, freight vehicles and urban buses. ZeEUS has given a boost to the clean (electric) bus understanding and deployment in Europe. It has helped stakeholders to understand and work on the challenges; and has been one of the reference activities of the European Commission in the development of the "Clean Bus Deployment Initiative". It is today followed by ASSURED that is focusing on the upscale of eBus fleets: interoperability of charging solutions, high power for charging, and smart charging.

Soon, UITP will launch a dedicated platform to support interested city stakeholders in the deployment of clean buses. It was another example of working alongside our global membership to modernise for the future.

As UITP works to advance our cities, we must remain aware of the fact that as urbanisation rapidly increases, so do concerns about the environment and air quality. With these concerns come a growing demand to produce more zero-emission vehicles. The shift to electric-powered vehicles is already well underway in public transport with electrification for more than 50% of metros and tram networks. In China, home to many of the biggest bus manufacturers and suppliers in the world, electrification has developed at a great speed. The Chinese market took the lead in the transition to electric vehicles following reports on air quality levels.

Now the country hosts the largest fleets of electric buses in the world, and continues to reduce air pollution through policy changes and a growing acceptance of a new sustainable culture.

It's clear that a great deal of research, procurement, development and advancements are being in the field of electromobility and energy within the public transport sector.

These technological advances are an opportunity for efficiently combining modes in urban areas, as cities that deal with growing mobility demand are seeking intermodal solutions to reduce congestion and improve air quality. I'm pleased that alongside our international membership, UITP can lead the way on this. Only by working together through research and intelligent debate, can our operators and authorities continue to make the necessary progress to produce the best, cleanest and most modern modes of public transport possible. With those aims in mind, UITP will always advocate for the many benefits using public transport has on our lives – making our cities more liveable being top of that list.

EPOS
SYMBIOSIS IN INDUSTRY

The EPOS project develops a simple and single management tool for exploring industrial symbiosis (IS) across process sectors. A wide range of technology and management solutions is proposed for supporting collaboration between sectors, by making industrial sites more efficient, cost-effective, competitive and sustainable.

From the start of the project, the consortium has challenged its process industry sites to get to know nearby companies from other sectors and understand their plants, operations, site streams and management. Meanwhile, new ways of doing cross-sectorial business are introduced and tested, always starting from a sound industrial pragmatism.

The UGent cluster management surveys map current and potential cross-sectorial IS cases. The prioritisation of IS opportunities from the longlist has initiated early IS deals within the EPOS clusters, inspiring generic business cases with IS potential for process industry clusters across Europe.

In parallel, after completing detailed energy studies on the EPOS sites using the EPFL energy optimisation platform Osmose and merging with the survey findings, the shareable streams are mapped, and virtual sector profiles built. These profiles are an open-innovative way to share industrial information from industries by simulating typical operating modes of a given industry sector. They enable a systems approach and are an essential part of the toolbox.

The case of heat recovery from an EPOS steel site feeding the Dunkirk district heating network (FR) serves as a textbook example of symbiosis. It points to the success factors driving over 30 years of operation on which the database of technical and non-technical indicators for the EPOS toolbox is built.

The new cross-sector IS cases at the Hull (UK) and Lavera (FR) industrial clusters have supported the EPOS toolbox development. The findings were used to challenge the metrics, system settings, functionalities and operating modes of the EPOS platform. Modelled and integrated into the toolbox is also a selection of more than 25 IS-supporting technologies. And not at least, the multi-objective optimisation function of the EPOS toolbox embeds sustainability and economic parameters that allow for the calculation of triple bottom line gains for a given set of IS solutions.

The EPOS User Club grants access to the EPOS toolbox and shares all guidance material on using the toolbox and investing in IS (manuals, background information, generic cases, etc.).

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SPIRE
Sustainable Process Industry through Resource and Energy Efficiency

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 679386. This work was supported by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 15.0217

ICT product energy efficiency as a science-based emissions-reduction target

By Dr. Klaus Grobe, Dir. Global Sustainability, ADVA Optical Networking SE

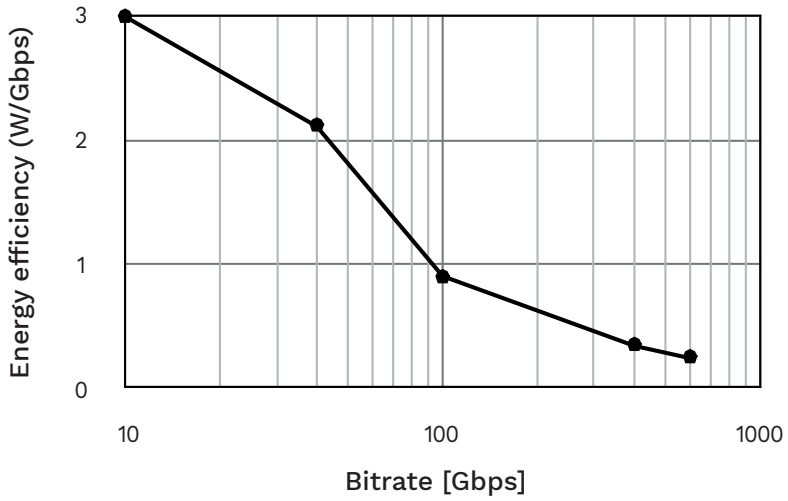
The Science Based Targets initiative is the most important global initiative for companies to commit to carbon-emissions reductions. By now, more than 550 companies have committed, with more than 200 having set targets. Participants must define Scope-1 and Scope-2 targets according to the Greenhouse Gas Protocol, and in case their total emissions are dominated by Scope 3, they must define a related Scope-3 target as well. In many cases, the first two targets relate to owned transport (e.g., a company car pool) and purchased electricity, respectively. Scope-3 targets, however, tend to being sector-specific, and their approval may consume considerable time.

Any targets must align with climate science, i.e., they must support the limitation of global temperature increase compared to pre-industrial time. In no case, absolute emission increase is allowed. This again may make certain Scope-3 targets challenging.

ADVA decided to commit in November 2016. We did this in order to set environment-related targets that the company can follow strategically over a period of 10 or more years. Our emissions are dominated by sold-products use-phase emissions, a Scope-3 contribution. These emissions are caused by the electricity consumption, and they can be influenced by ecodesign focusing on energy efficiency. The use phase of our products is dominant for two reasons. First, as ICT (information and communications technology) core-network equipment, the typical use mode is 24/7 always-on, and use phase often exceeds 10 years. Second, the equipment is subject to the quickly growing ICT bitrates. This growth eats most of the gains in energy efficiency, making the related target challenging. In addition, company growth must be considered, especially for target runtimes of 10 or more years.

ADVA submitted the three targets in September 2017. After several rounds of fruitful discussions with the initiative (and related changes and intensification), the targets were approved in April 2019. For Scope-3, we committed to 3% total reduction of the use-phase emissions of all products sold in the target year 2032, compared to the base year 2016. This seems to be low, but the reduction has to work against both, company growth (i.e., more products sold) as well as the sustained ICT bitrate growth that requires more powerful equipment in terms of its throughput. Over the next couple of years, this target will drive our ecodesign activities, leading to most energy-efficient products. This is supported by improving emission factors, i.e., the amount of carbon emitted by kilowatt-hour consumed.

Next to the increasing ICT bitrates which made the Scope-3 target challenging, there is another ICT aspect worth considering in this context. Proper use of ICT services can enable decarbonization in other areas, e.g., in transport, smart grids etc. We sometimes call this Green by ICT. In a global context, this could mean that ICT may be given a certain emissions allowance to support this. The question for now remains how to do this in a fair and scientific way. Perhaps, this is for future rounds of the initiative.



Example for ICT energy efficiency: development for fiber-optic transport in dependence of the bitrate. Strong efficiency improvement can be seen.

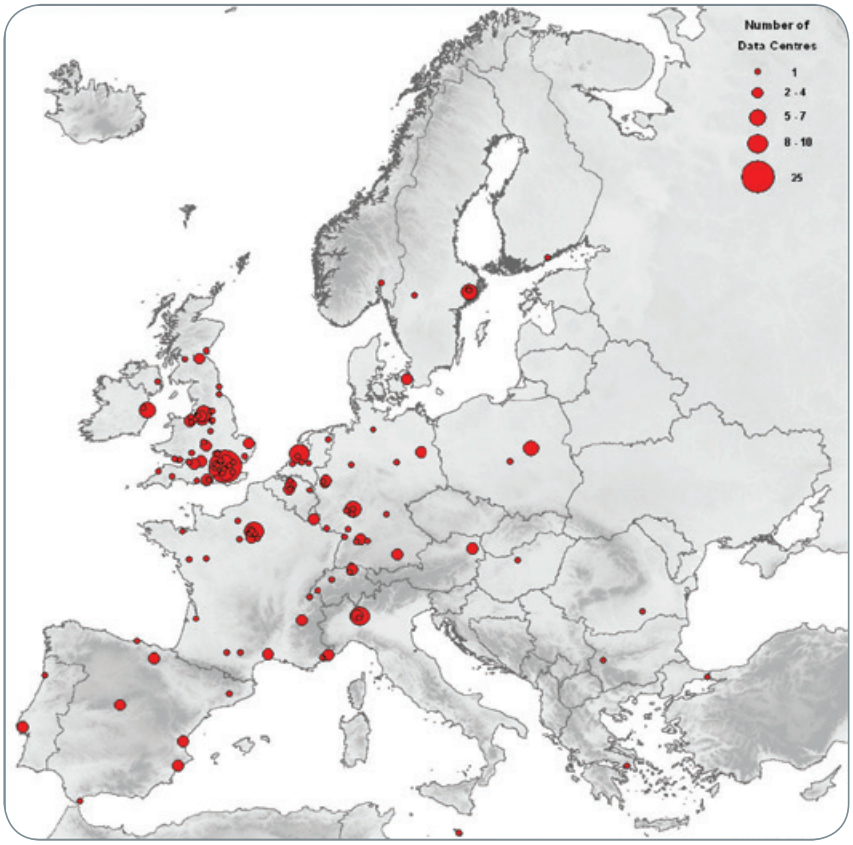
The European Code of Conduct for Energy Efficiency in Data Centres

By Luca Castellazzi, Tiago Serrenho, Paolo Bertoldi, European Commission, Joint Research Centre

The European Code of Conduct for Energy Efficiency in Data Centres (EU DC CoC) programme is a voluntary initiative started in 2008 and managed by the European Commission's Joint Research Centre (JRC), which addresses primarily data centre owners and operators, and secondly the supply chain and service providers.

The EU Code of Conduct is a flexible voluntary programme to initiate and develop new policies within the data centres sector to raise energy efficiency. The EU DC CoC is also a forum for the industry, experts and Member States to discuss energy efficiency. With an open and continuous dialogue regarding market developments and product performances, the EU DC CoC has the objective to identify and focus on key issues and agree on solutions among the participants, along with the setting of ambitious voluntary standards and commitments.

The aim of the EU CoC is to raise awareness among managers, owners, investors, with targeted information and material on the opportunity to improve efficiency, to provide an open process and forum for discussion representing European stakeholder requirements, to create and provide an enabling tool for industry to implement cost-effective energy saving opportunities, to develop a set of easily understood metrics to measure the current efficiencies and improvement, to produce a common set of principles in harmonisation with other international initiatives and finally to support procurement, by providing criteria for data centres and key IT equipment (based on other Codes of Conducts for IT products).



The EU DC CoC covers Data Centres of all sizes, from server rooms to dedicated buildings, existing and under development. It covers both the IT power and the Facility power and takes into consideration the equipment procurement and the system design.

In order to participate in the EU CoC programme there are two possibilities: Data Centre owners and operators can join as Participants and vendors, consultants or industry associations can join as Endorsers.

The participation process, for existing data centres, starts with a partnership application and an initial energy measurement and energy audit to identify the major energy saving opportunities based on the EU DC CoC Best Practice document. Then, an Action Plan must be prepared and submitted. Once the Action Plan is

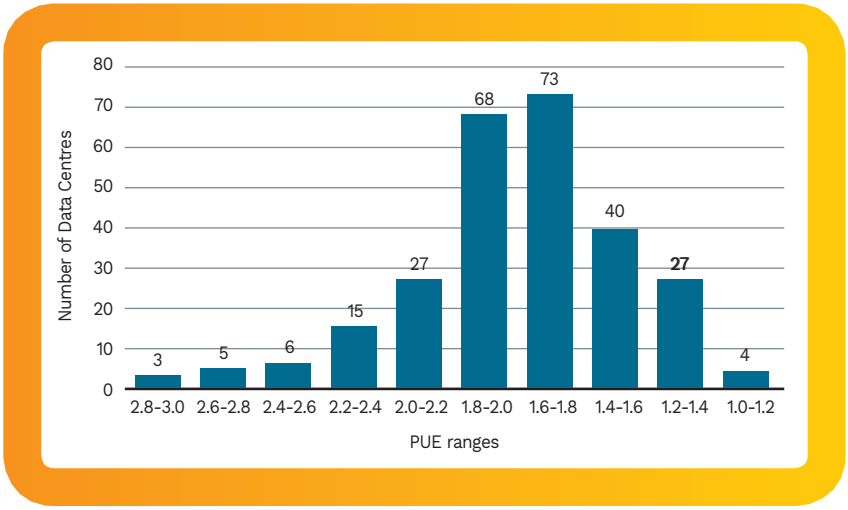
accepted the Participant status in granted.

Participants must implement the Action Plan according to an agreed time table with Energy consumption needing to be monitored regularly. The Participant then carries out its Action Plan, and reports at the completion of the actions to the JR, which will then review the Participant's report, and check whether it corresponds to the Action Plan.

All participants have the obligation to continuously monitor energy consumption and adopt energy management in order to look for continuous improvement in energy efficiency. One of the key objectives of the EU DC CoC is that each Participant benchmark their efficiency overtime, using the EU DC CoC metrics (or more sophisticated metrics if available) so to have evidence of continuous improvements in efficiency.

In 2018, the EU CoC has reached its 10 year anniversary, showing great vitality, which has allowed for a reflexion on the achievements. Below, it is possible to see the geographical distribution of the EU DC CoC, reflecting well its EU-wide nature.

As it should be expected with different geographical, also the energy efficiency and the PUE – Power Usage Effectiveness (which measures how efficiently a Data Centres uses energy[1]) will be very different with north European DCs needing less energy to cool down the data centre due to free cooling technologies, by using the external coodl air to cool the Data Centre itself. From the 289 DCs evaluated in the 10-year report of the CoC, the average PUE in Nordic countries was of 1.71, 1.83 in the UK and Ireland, 1.72 in Northern/ Central Europe and 2.00 in Southern Europe, which are excellent values for these regions.



It is possible to see in the graph below also that the great majority of participating Data Centres are in the below 2.0 of PUE range, with the biggest number of DCs being in the 1.6-1.8 PUE.

Along the more than 11 years now, it has been possible to see the advantages for Data Centres, which participate in the EU DC CoC. Some of the encouraging results relate with a declining PUE on a yearly basis and an average of 1.8 for all the Data Centres. To be noted that several DCs present PUE values below 1.2, which can be considered excellent. In particular in the last two year the PUE has declined to around 1.4. In total in May 2019 over 320 data centres are approve as Participants in the EU DC CoC.

As it was to be expected, the DCs located in Scandinavia, traditionally have higher efficiencies, and here it is no different. Also to be noted in the assessment results that smaller and larger DCs are performing better, in comparison with average DCs.

There is an increasing interest for the Code of Conduct among Data Centre operators, since it is the only independent pan European scheme in the EU to certify that a Data Centre has adopted energy efficiency best practices. With the collection of DC data to track efficiency improvements over time, the European Code of Conduct for Energy Efficiency of Data Centres is the go-to programme for all of the interested parties within the Data Centre ecosystem to rely on, in terms of straightforward thinking and sound scientific proof that implementing this voluntary scheme will bring great benefits to the developers, users and the environment. Benefits for participants includes lower energy bills, reduced CO_2 emissions, green image, and participation in the EU DC CoC Annual Award.

[1] PUE= Total Facility Power/ IT Equipment Power. In theory a PUE = 1 is the ultimate objective of efficiency.

For general information on the Code of Conduct visit:
https://ec.europa.eu/jrc/en/energy-efficiency/code-conduct/datacentres
https://e3p.jrc.ec.europa.eu/communities/data-centres-code-conduct
https://e3p.jrc.ec.europa.eu/publications/2019-best-practice-guidelines-eu-code-conduct-data-centre-energy-efficiency

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QUIET project

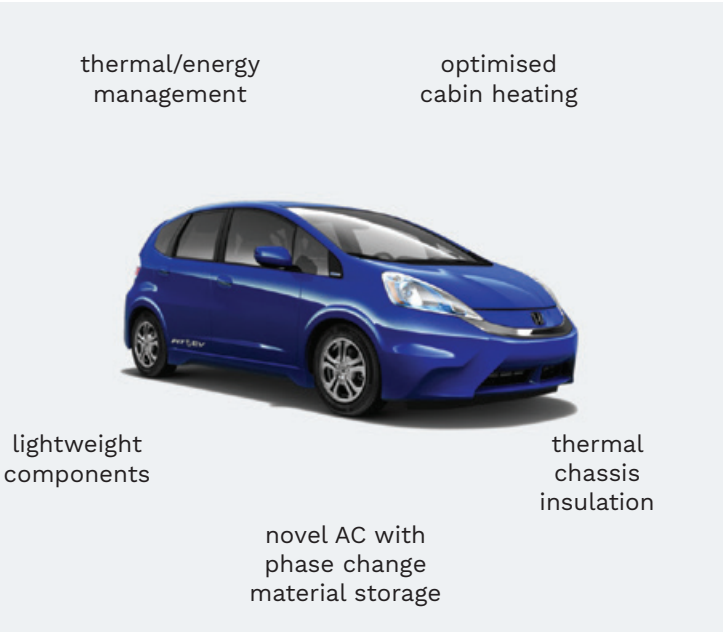
Qualifying and implementing a user-centric designed and efficient electric vehicle

Current activities in the field of vehicle electrification offer a great potential for contributing to climate change mitigation by reducing anthropogenic CO_2 emissions. Beyond the environmental strain, there is also an economic one. In 2017 the automotive sector accounted for 4% of EU's GDP employing approximately 12 million people in the manufacturing, sales, maintenance, and transport domain.

It is therefore crucial for the European automotive industry to exploit not only the environmental benefits, but also the business opportunities which come from the transition from conventional fuel powered to electrified vehicles. In order to capture these opportunities, electric vehicles must deliver better performance at a lower price, overcoming the constraints that are currently limiting their mass-market uptake. One major constraint is the limited driving range compared to conventional vehicles due to the limited battery capacity and high cost of the electric energy storage systems.

The QUIET project aims at developing an improved and energy efficient electric vehicle with increased driving range under real-world driving conditions. This is achieved by exploiting the synergies of a technology portfolio in the areas of user-centric design with enhanced passenger comfort and safety, lightweight materials with enhanced thermal insulation properties, and an optimised vehicle energy management.

The developed technologies will be integrated and qualified in a Honda B-segment electric vehicle validator. Among these, a novel refrigerant for cooling, combined with an energy-saving heat pump operation for heating, advanced thermal storages based on phase change materials, powerfilms for infrared radiative heating, and materials for enhanced thermal insulation of the cabin will be investigated. Further focus is put on lightweight glasses and composites for windows and the chassis, as well as light metal-aluminium or magnesium seat components. Optimised energy management strategies, such as pre-conditioning and zonal cooling/heating in the passenger cabin as well as user-centric designed cooling/heating modules will further enhance the thermal performance of the vehicle. These strategies will be seamlessly implemented in an intelligent vehicle control unit enhanced by a novel Human Machine Interface, which, beyond being intuitive and user friendly, will also consider diverse users' needs, accounting for gender and ageing society aspects.



The objective of the QUIET project is to reduce the energy needed for cooling and heating the cabin of an electric vehicle under different driving conditions, by at least 30% compared to the Honda baseline vehicle. Additionally, a weight reduction of about 20% of vehicle components (e.g. doors, windshields, seats, heating and air conditioning) is addressed. These efforts will finally lead to a minimum of 25% driving range increase under both hot (+40°C) and cold (-10°C) weather conditions.

The QUIET project consortium involves a collaboration of 13 multi-disciplinary and complementary partners from industry and research originating from 6 different countries. All public deliverables and further information about QUIET are available at https://www.quiet-project.eu/.

Acknowledgement: The QUIET project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 769826.

The three levers of energy transition in Belgium

By Marie-Christine Marghem, Minister of Energy, Environment and Sustainable Development

In recent years, the security of electricity supply has been a growing concern for Belgium. This concern can be explained by a number of factors, including aging production infrastructure, national energy policy choices, and increased electricity production from renewable energy sources and the intermittent nature of this production.

Also, my goal as Minister of Energy, Environment and Sustainable Development has been to permanently anchor Belgium in the energy transition. To this end, I have concluded with the regional entities the Inter-federal Energy Pact, which devotes a central place to renewable energies and policies, as well as mobility, which will contribute to the sustainable reduction of Belgium's greenhouse gas emissions. .

This Pact has also found wide expression in the National Energy-Climate Plan (NECP) that Belgium has presented to the European Commission. Technology and innovation are obviously central to this Pact and in this legislature we have put in place three fundamental levers linking transition and innovative technologies.

The transition fund

This fund is intended for measures to encourage and support research and development in innovative projects. It is also intended for measures to maintain and / or develop and / or search for a system to ensure the security of supply and the balance of the network, in particular with regard to the production and storage of energy, as well as demand management. A technology neutral approach is applied in this regard.

Offshore wind

With the dual objective of meeting the nuclear exit schedule and decarbonising our economy, the federal government has continued to expand our wind capacity in the North Sea. We want to continue the development of offshore wind turbines in the North Sea until its installed capacity reaches 4GW by 2030. Offshore wind power currently accounts for 5% of Belgium's total electricity demand. It will reach 10% by 2020. By 2030, offshore wind generation will account for 20% of total electricity demand.

CRM or Capacity Remuneration Mechanism

In response to the need for new generation capacity due to the nuclear phase-out, I passed a bill in Parliament creating a technology-neutral capacity compensation mechanism that will be eligible for gas, storage and Demand Management.

MARIE CHRISTINE MARGHEM
Ministre fédérale de l'Énergie,
de l'Environnement et du Développement durable
Federale Minister van Energie,
Leefmilieu en Duurzame Ontwikkeling

Belgian perspective on innovation within the EU Energy Union Policy

By Lieve Wieringck, MEP and Lydia Peeters, Flemish Minister for Finances, Budget and Energy

Many GoT fans would disagree if I say that winter is a yearly season and comes every year, at quite a predictable time. Nevertheless, we can all agree that winter can be quite unpredictable and can give us unsteady supplies in our energy security.

The recent temporary shutdown of several nuclear power plants in Belgium is a reminder of the need to redirect our entire national energy supply system. The situation of the fallout of the nuclear power plants has led to an increased dependency of Belgium on electricity imports from neighbouring countries. This dependency is already relatively high: in 2016 only Luxembourg and Malta had a higher import rate than Belgium.

This underlines the need for a real Energy Union; a Union of which regional cross-border cooperation and a well-functioning European, interconnected electricity market are the building blocks to secure our energy supply in Belgium. Not to have such an Energy Union will inevitably result in energy insecurity, accompanied by vast economic risk as a result. Last winter, pessimistic prognoses became reality as Belgium was forced to call upon its neighbouring countries to provide assistance to ensure the availability of import capacity and help reduce load shedding. In addition, Belgian authorities have taken a number of safeguard measures to preserve security of power supply, bringing additional capacity back to the market.

Belgium is one of the best-connected countries for gas in the European Union with a highly diversified gas supply. This brings numerous advantages and opportunities. Whether synthetic, green gas, or hydrogen, all can be used for seasonal energy storage. By 2025, it could presumably be possible to import 50% of the peak capacity.

However, there is also a dangerous downside to this comfortable position. Belgium is developing an increasing level of dependency that is a consequence of its import capacity, the evolution of the available production capacity in neighbouring countries and the actual available commercial capacity on the interconnections. In 2018, the Member State shattered one import record after another, with the highest import levels in history at the very end of the year. On 26 December, at one point, Belgium imported 5,234MW, which comes close to the total of the entire Belgian core park (5,92MW).

In the past legislation, the Belgian federal government of 2014-2019 searched for a common, more sustainable approach in order to solve the bottleneck problem in the long term. In March 2018, the federal government and the three regional governments agreed on the Interfederal Energy Pact, which provides a long-term vision on how Belgium intends to handle the energy transition. As Belgium has committed to fully phasing out nuclear energy by 2025, there is need for significant additional investments in power generation, as well as in interconnection capacity, smart grids and storage.

"We can't outrun 'em, but we can outsmart 'em"

In order to phase out the nuclear capacity in Belgium, there is a high need to invest in climate mainstreaming. (Former) Flemish Minister for Energy Bart Tommelein has set the pace for an ambitious strategy.

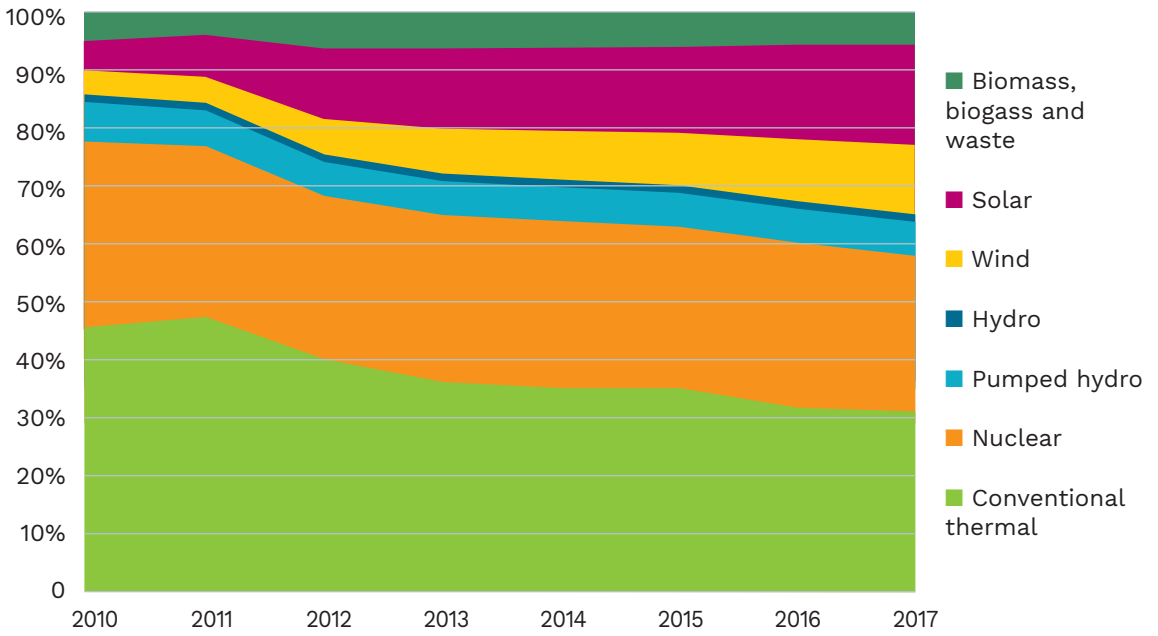
A good example are the grants to six new floating solar panel projects. Together, the solar projects will receive a maximum of €4.1 million in support, representing 11MW of renewable energy.

Each of these projects has an innovative character and is testing a number of innovations. For example, they introduce lightweight solar panels, double-sided solar panels with active cooling, special anchoring in the ground and verges, raft structures that can withstand large water level fluctuations, snow loads and ice pressure, and so on.

The former Minister gives an important signal as innovation plays a key role in achieving our renewable energy objectives. This will be the basis of the energy transition. Let there be no misunderstanding: Our prime weapon and ally in the battle against climate change is innovation![1]

In addition to new investments, it is important that the relevant production factors are available, in particular the skilled labour forces. In Belgium we urgently need to address labour shortages, we run

Installed capacity in Belgium by production technology



Source: Febeg

specifically short of people with the STEM (science, technology, engineering and mathematics)-skills and competences. Thus, additional investment and reform of our education system is a vital part of the solution.

Every Member States has its particular problems. However, we do see a common denominator in certain trends that demand an approach at EU-level. One of those is the continuous need to invest in new technologies, techniques and new sources of energy.

As the shadow rapporteur in the Regulation and Implementation of Horizon Europe, I persistently pleaded that at least 35% of the projects shall revolve around climate mainstreaming. What we have also noticed in the previous evaluations is that there is a (co-)relation between the success rate of a Member State to obtain such funding and the rate of its own investments in research and innovation. Member States have pledged to dedicate 3% of their GDP to research and innovation by 2020. So far, Belgium is at 2,54%, with Flanders at 2,7%. By the end of 2020, Belgium will have received €1.38 billion from the 8th Framework Programme Horizon 2020. Only through a strong commitment from the Member States, the EU can be a key enabler of new technologies.

Smart investments in innovation are vital for dependent countries. Current Flemish Minister for Energy Lydia Peeters has laid down the provisional banding factor of 0.944 for the floating solar panel park "Floating PV Groeve Schans Sibelco" in Dessel in a Ministerial Decree. Based on the provisional banding factor, the investor will have a good estimate of the support to which he is entitled. After the delivery of the environmental permit, the final banding factor is assigned.

'We expect a higher return from these floating solar panels due to the new technologies. Support from the Flemish government remains necessary for profitability, but we avoid over-subsidies.', said Minister Lydia Peeters.[2]

With funding programmes such as Horizon Europe, worth €100 billion, and with national initiatives to enable smarter and more sustainable energy solutions, gas and oil imports are slowly but surely on the retreating end of the scales. In the end, this will not only enable the transition. It will become a driver for sustainable growth and a source for renewed wealth that will provide the basis for our future welfare State.

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[1] https://www.tommelein.com/zes-nieuwe-projecten-drijvende-zonnepanelen/
[2] https://www.lydiapeeters.be/minister/voorlopige-bandingfactor-zet-licht-op-groen-voor-drijvend-zonnepanelenpark-in-dessel/

100% renewable energy in Belgium? We've got the power.

By Benjamin Wilkin (pictured), APERe

Initiated before 2000 with the optimisation of waste management, the significant growth of renewable energy in Belgium took place in the first decade of 2000, with the European obligation to set up supporting schemes for renewable electricity. Onshore wind power came first, followed by solar PV (dramatically in 2009-11). Simultaneously, Belgium became a pioneer in offshore wind power, with the phased construction of several parks in an area whose equipment will be completed in 2020. A good start... But how will we get to 100% renewable energy?

Limited Hydropower

Hydroelectric generation is relatively limited in Belgium because it depends mainly on streams. In March 2018, the installed capacity of 109MW was spread over 154 sites, mainly in Wallonia (106.5MW). 83% of this power is run-of-the-river, the remaining 17% coming from dams. In 2017, the annual production was 240GWh.

Although limited, hydropower is highly reliable. The generation is almost constant from autumn to early summer, making for an excellent base for a renewable energy mix and a good addition to wind during cold weather.

Going with the wind

Wind power is constantly increasing in Belgium. Our territory counts 1162 wind turbines (including 274 offshore turbines), for a power of 3190MW that generate 6.5TWh annually, whose nearly half is produced by the offshore turbines.

In the North Sea, new parks should bring the total number of offshore wind turbines to a minimum of 409 and a maximum of 433 by 2020, bringing the power from 1,448MW to nearly 2,280MW. A new offshore concession (spring 2018) is expected to double the installed capacity and to grant offshore wind a major role in the winter electricity mix of Belgium.

According to the observed load factor of 40% and a nominal power of 4000MW in 2026, offshore wind farms will provide a little less than 30% of the electric power required in windy cold weather, or 18% of the electricity consumed annually by Belgium. Realistically (and ambitiously), 10,000MW could be installed in 2050, producing 37TWh per year.

Onshore wind could easily reach 9,000MW in 2050. With a load factor of 22%, the onshore wind farms could produce 45% of the electric power needed in cold windy weather, or 21% of the Belgian annual consumption.

Altogether, on- and offshore wind power could produce 40% of the electricity consumption in 2050, based on ongoing projects and realistic assumptions. With a more ambitious scenario (10,000MW

Today in Belgium (mid 2019)	
Solar PV	4,000MW
Onshore Wind	2,119MW
Offshore Wind	1,448MW
Biomass (wood pellets)	758MW
Heat from waste incineration	145MW
Hydropower (run-of-the-river, mainly)	108MW

offshore as stated above), we could get to 67%, with 53.8TWh per year.

Still a long way to go... and electricity makes for only a fifth of our energy consumption. Based on ambitious but realistic assumptions considering environmental limitations, APERe foresee a maximum renewable potential of 157TWh per year in 2050. Belgium consumed 387 TWh in 2015. 230TWh should therefore "disappear", through sobriety and efficiency measures. Some could also be imported from neighbouring countries with renewable energy surplus. 230TWh means 59% of energy savings. We should definitely get going and aim to feed on local energy while minimising the need for storage. Reducing energy consumption is key to achieve the 100% renewable goal that will protect both our planet and our future.

2018 Belgian renewable electricity mix

By the end of 2018, the share of renewables in the Belgian electricity mix was 19%, divided as followed

Solar phootovoltaic 4.3% Biomass (not waste) 5.5%
Hydroenergy 0.3% Biomass (Heat from waste) 1%
Wind onshore 3.8% Wind offshore 4%

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All the way to net-zero: decarbonising heavy industry in Europe is feasible

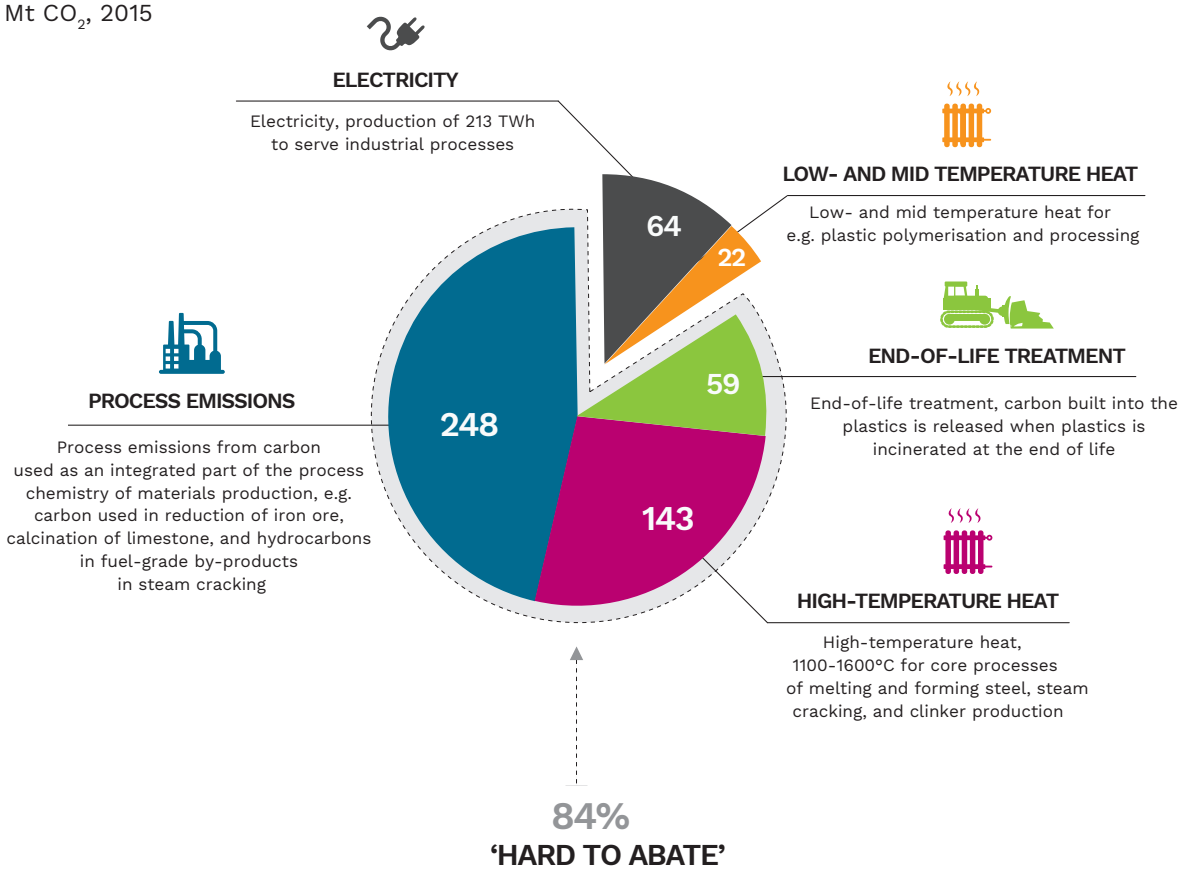
By Rannveig van Iterson, Simon Wolf, European Climate Foundation

After many years of slow progress, solutions for deep decarbonization of heavy industry become visible and stakeholders develop an EU industry climate strategy to get there

Heavy industry has been the stepchild of European climate debates and policy making for many years. The sector is covered by the European Emissions Trading System (ETS), but a vision for deep decarbonization of the European steel, chemicals, cement and other energy and e mission intensive industries was widely missing until very recently. The reason for this is that these sectors

Why CO_2 emissions from industry are 'hard to abate'

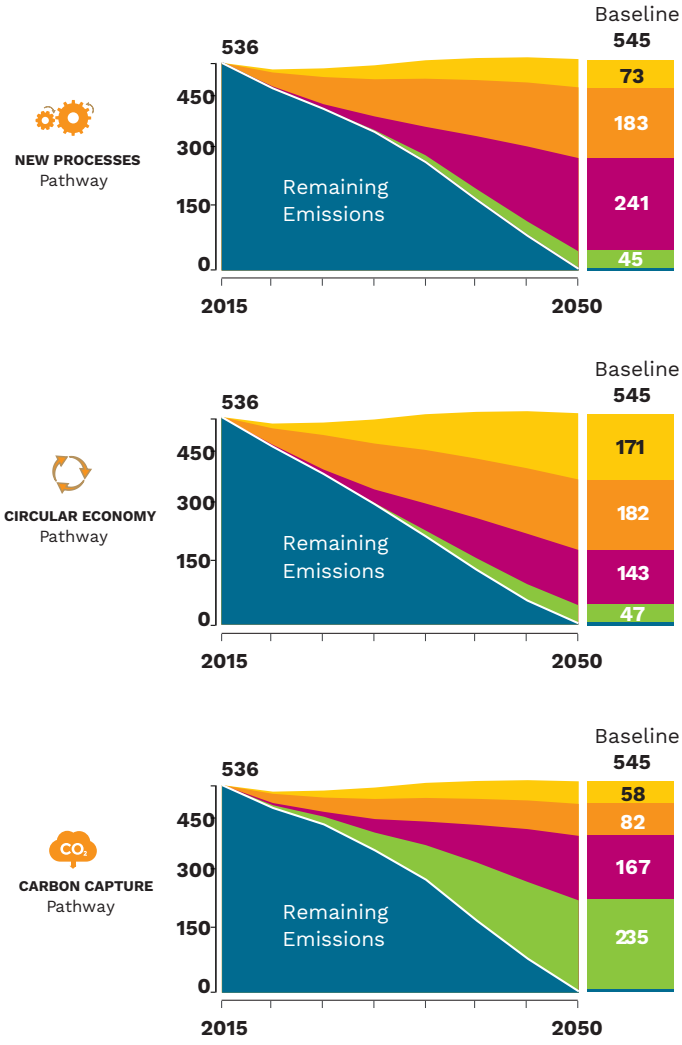
Sources of CO_2 emissions from steel, cement, plastics, and ammonia (100% = 536 mt co_2)
Mt CO_2, 2015



Source: Material Economics Analysis / Industrial Transformation 2050

Pathways to net-zero emissions for Steel

Emission reductions from steel, chemicals, and cement
Mt CO_2/Year



- Relies heavily on new core industrial processes driven by electricity, either directly or through the use of hydrogen
- Key enablers are abundant and cost-competitive electricity supply and rapid commercialisation of new processes

- Hinges on the potential of a more circular economy for materials recirculation and increased materials eciency
- Key enablers are new business models, digitisation and extensive coordination across the value chain

- Emphasis on a greater role for carbon capture and storage (CCS)
- Key enablers are a critical mass of infrastructure and risk distribution for CCS, and reconguration of production processes to allow for high CO_2 capture rates

Source: Material Economics Analysis / Industrial Transformation 2050

were considered “hard to abate”: A substantial share of these emissions cannot be mitigated by simply switching to renewable energy, as they are related to fossil feedstocks (oil and gas for chemicals), process related (steel, cement), or stem from the use of high temperature heat (see display 1 – source: Material Economics, 2019, p.21).

As with many things, the Paris climate agreement has been a game changer for these sectors – for the transition to net zero emission economies the Paris agreement demands, all sectors will eventually have to fully decarbonise.

In this spirit, the discussion on mitigation opportunities and

pathways in the heavy industry sector has picked up more recently. A number of reports in 2018 highlighted the increasing readiness of innovations to decarbonise heavy industry production processes;[1] the by then widely neglected potential of the circular economy and radical materials efficiency to reduce the GHG emissions from materials production and use;[2] and, in a report commissioned by 11 European Energy Intensive Industries (EIIs), the need for a new and integrated industrial strategy to enable a competitive low-CO_2 transition for heavy industry.[3]

In November 2018, the European Commission published its strategic vision for long-term emission reductions "A Clean Planet for All", where it strongly endorsed the net-zero vision for Europe by 2050, and also highlighted that there are several pathways for radically reducing the emission of heavy industry sectors.

How these pathways could look like in more detail and eventually lead to net zero emission was described more recently in a report authored by Material Economics with the support of the Wuppertal Institute and Institute for European Studies at the Vrije Universiteit Brussels, "Industrial Transformation 2050 – Pathways to Net-Zero Emissions from EU Heavy Industry".[4] It shows that that NZ emissions for heavy industry in 2050 is possible, and that all pathways need to use the entire tool box to get there, from circularity to breakthrough technologies on the supply side and carbon negatives (see display 2 for steel – source: Material Economics, 2019, p.2).

The report also reveals a second crucial insight, which could be described as a "cost paradox": the costs of the net-zero heavy industry transition are overall manageable at the macro level and will lead to reasonable price increases for those products that use a lot of basic materials, like cars, buildings, or plastics bottles (less than 1% per final consumer goods). But the challenge for individual industry companies will be significant, since the costs of materials will go up between 20 to 115%, with steel at the lower and cement at the higher end.

As a consequence, the net zero transformation of heavy industry requires careful management to make sure that competitiveness of industrial firms is maintained and the EU can sustain its heavy industry base, which is a crucial backbone to many other industrial sectors and value chains.

How such management could look like is currently discussed in the High Level Expert Group on Energy Intensive Industries under the leadership of DG Grow. The group has set out to develop until the end of 2019 no less than an "Industrial Transformation Master Plan for climate-neutral industry by 2050".

This is a comprehensive task that will require combining a great number of policy areas. A first flavor of this was recently presented by the IES at the VUB.[5] There blueprint for an "Industrial Strategy for a climate neutral Europe" lists no less than around 50 policy ideas spanning innovation, investment, circular economy and infrastructure policy.

The report also highlights that orchestrating the industry transformation across such a great number of policy areas requires careful coordination, and suggest reflecting that in the structure of the next EU Commission – a Vice President for Industrial Strategy could make sure that an industry climate strategy will provide enough legislative teeth and support mechanisms to fully transform the heavy industries.

[1] Axelson, M., Robson, I., Wyns, T., Khandekar, G. (2018). *Breaking Through - Industrial Low-CO_2 Technologies on the Horizon*. Institute for European Studies, Vrije Universiteit Brussel.

[2] Material Economics (2018). The Circular Economy. A powerful force for climate mitigation

[3] Tomas Wyns (2018). Industrial Value Chain. A Bridge Towards a Carbon Neutral Europe. VUB IES

[4] Material Economics (2019). Industrial Transformation 2050 – Pathways to Net-Zero Emission from EU Heavy Industry

[5] Wyns et. al., (2019), *Industrial Transformation 2050 – Towards an Industrial Strategy for a Climate Neutral Europe*, IES.

3.3 Degrees

By Adel El Gammal (pictured), Secretary-General of the European Energy Research Alliance (EERA), on approaches to mitigate upcoming climate chaos.

Just over three years ago, high representatives from 196 state parties adopted the Paris Agreement, in a pledge to keep the increase in global average temperature to well below 2°C above pre-industrial levels by the end of the century; with efforts to limit the increase to 1.5°C.

On this 12 December 2015, hopes were high that human kind could transcend its first ever existential challenge though uniting global efforts across nations.

On course to double our target for global warming...

Political gesticulations do not suffice anymore to hide the crude and stark climate reality; and citizens now protest daily their anguish over climate chaos in their millions.

Despite Paris Agreement promises, global emissions have continued growing relentlessly. Current policies are putting earth on a trajectory towards 3.3°C[1] warming by end of century.

Climate Scientists across the world agree now on the "carbon budget", the total amount of CO_2 the world could still emit for containing warming to 1.5°C or 2°C by end of the century.

Even in an overly optimistic scenario, were emissions would be kept to their current levels, the carbon budget limiting warming to 1.5°C with 67% probability would be blown in 2030. Just 10 years from now. Less than three times the period wasted since Paris Agreement was adopted.

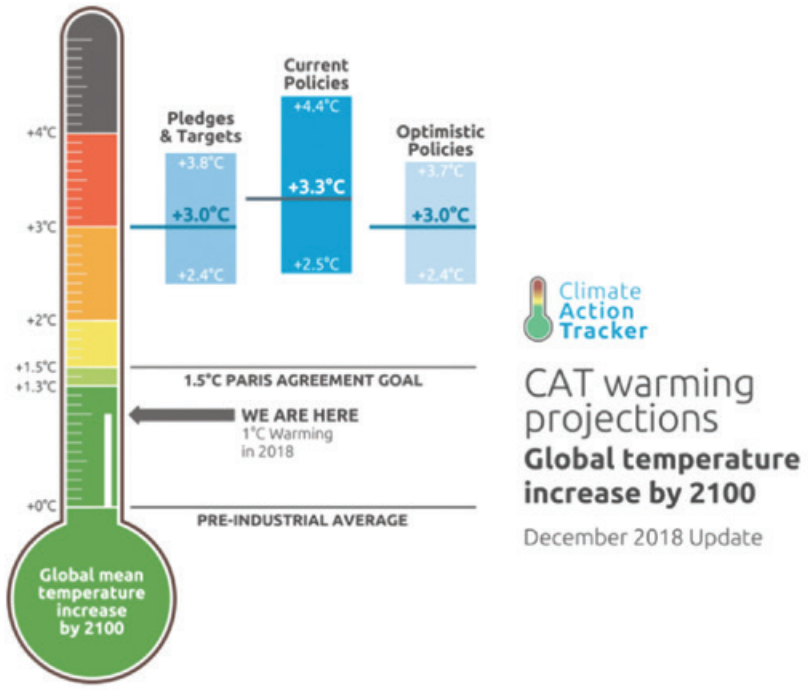
Science has delivered technology faster than ever before

Today, more than any time before in human history, the pace of scientific development and scale of technological adoption have been mind-blowing. Many renewable technologies considered only 10 years ago as mere unrealistic engineer's fantasies, have become competitive mainstream energy technologies. For instance, cost of photovoltaics decreased by 85% over the last eight years, and by 50% just during the last three years, making it a highly competitive technology, as is already on-shore wind. Others are on a fast track to competitiveness.

And more. Beyond these known – now mainstream – technologies, scientists think the unthinkable. For instance, leading European research centers and universities are working on the promises of artificial Photosynthesis, allowing direct transformation of sunlight into chemical fuels and net climate neutral feedstock[2].

But despite this unprecedented scientific evolution and technological development, we are collectively

Reference: Climate Action Tracker, December 2018 update



failing to curb emissions. The latest data suggests that we are on the verge of reaching tipping points in climate and ecosystems that might lead to an acceleration of planetary destabilization.

Since the "Age of the Enlightenment", man has consistently relied on scientific and technology development to overcome – or displace – the challenges of human society. But can technology now alone save human life on earth?

A new Age of Enlightenment: Science beyond technology

In the race to reduce emissions, technological development is a key enabler; but reaching climate neutrality is calling for actions reaching far beyond technology. It is about how human activity can fundamentally restructure itself towards climate neutrality and how technology can be put at best use to support this transformation.

The Mission is to make society climate neutral, not to develop new technologies

The ultimate and only relevant goal for humanity is to avoid climate chaos by containing global warming.

Only a holistic, cross-sectoral and systemic approach can tackle such a challenge. It implies fundamentally rethinking the globality of human activities in all their relationship to energy in whatever of its forms. For instance, electrifying mobility only supports this mission, if carbon-free generated electricity is used to charge batteries that have been assembled with efficient and sustainable processes, and if circularity is implemented for core materials they use. And only if the resulting distributed electrical storage is designed as integral part of the electricity system can it avoid over dimensioning generators, transport and distribution networks or central storage. Furthermore, only if electricity, heat and gas networks are properly coupled, will we be able to use synergies, complementarities and switching capabilities between and across the various energy vectors. Only a systemic holistic and cross-sectoral restructuring of human activity can achieve the challenge of climate neutrality.

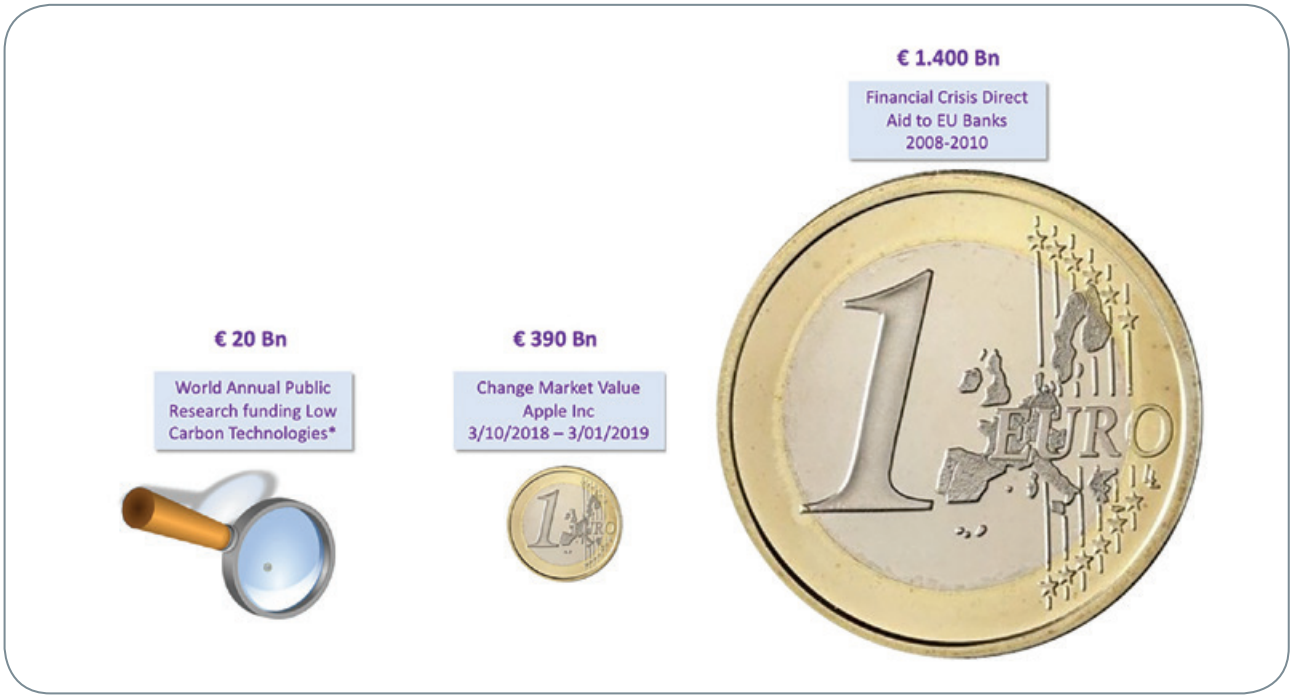
No climate neutral society without social and lifestyle innovation

Today, economic and demographic growth are still strongly coupled to increasing carbon emissions, and the progressive alignment of the poorest countries to western standards reinforces this development. We witness the Jevons paradox: thanks to technological progress, we need less resources, but at the same time the rate of consumption rises, so that the gains are lost.

With the current limits to decoupling these parameters, achieving decarbonization targets will require, beyond technological breakthroughs, deep understanding of the drivers that enable us to steer the profound transformation of our core societal values.

Reaching climate neutrality will require a drastic change in the way citizens relate to energy production, conservation and consumption, a shift that needs to materialize in a much shorter time lapse than lifestyle, cultural and societal changes have historically occurred. Market mechanisms alone are highly unlikely to drive such a profound change, especially considering the well-known "rebound effect" through which household energy savings are usually mostly converted into other carbon-rich economic activities.

In that respect, social innovation will be essential to better understand how human kind can reinvent its society at a pace and to an extent that were never historically achieved. Climate urgency calls for new ways of thinking, designing, testing, implementing and deploying new



societal models. Only trough allowing non-linear and cross-sectoral approaches fostering collaborative contribution of wide categories of historically disconnected stakeholders into a joint co-creation and co-designing effort, could human being invent new appealing society models and lifestyles that can be deployed and generalized at the required speed and scale.

Governments have a historical responsibility in redirecting funding

Progress beyond any expectations has been achieved in many low-carbon technologies. But to fully unleash the potential of existing and upcoming technologies, to redesign the technological, financial and societal system in which they need to interact, much more ambitious funding programs are needed, both at national and international levels. According to IEA, the global public low-carbon energy RD&D budget was about €20 billion in 2018[3].

In contrast, in the aftermath of the 2008 financial crisis, more than €1,400 billion of direct aid from public money were authorized to 215 financial institutions[4] representing about 70 times the world public annual speding in low carbon RD&D.

This suggests an absolute misjudgment of urgency, and the absence of political vision and ambition to combat the highest threat human kind has ever faced. Governments have now a historical responsibility to boldly reset the societal priorities by channeling public money and stimulating private investment with the scale and speed required by the immense challenge of transforming the technological, economic and societal foundations needed to decarbonize the society.

About EERA

The European Energy Research Alliance (EERA) is an association of European public research centers and universities active in low-carbon energy research.

EERA's mission is to Catalyse European energy research to achieve a carbon neutral society by 2050.

Bringing together more than 250 organizations from 30 countries, EERA coordinates research activities through 17 joint research programs. EERA is a key player and official partner in the EU's Strategic Energy Technology (SET) Plan.
In line with its Mission, EERA is committed to supporting Europe in achieving a successful energy transition in line with the EU's climate 2050 goals and Paris commitments.

[1] Climate Action Tracker, December 2018 update
[2] "Sunrise" FET Flagship preparatory phase – an EERA partnership led consortium
[3] IEA Statistics – Energy technology RD&D budgets – May 2019
[4] The cost of interventions in the financial sector since 2008 in the EU countries ", Antonio Millaruelo and Ana del Río, Banco de Espana, Eurosistema, April 2017

Biogas production of organic by-products from the food industry

By Emma Lindkvist (pictured), PhD student at Linköping University and the Biogas Research Center, Linköping, Sweden.

A transition in the energy sector towards renewable energy s ources is necessary. Anaerobic digestion of biomass (substrate) to produce biogas is one alternative. Biogas consists mainly of methane (40-80%), but also carbon dioxide and traces of other gases. Biogas can be used for heat and electricity generation as well as vehicle fuel, if the biogas is upgraded to biomethane. When upgraded to biomethane the methane content in the gas increases to around 97%. Biomethane can also be injected into natural gas grids.

The substrate is often pretreated at the biogas plant before digested in the digesters. Pretreating can, for example, include hygienization to sanitize the substrate and disintegration, e.g. making the pieces of substrate smaller, to enable a faster digestion. The substrate is thereafter digested in an anaerobic environment in the digesters by methane-producing microorganisms. Biogas is collected from the digesters and the remaining organic matter, which is rich in phosphorus and nitrogen, can be used as fertilizer on farm lands.

The food and drink industry are the largest manufacturing industry in Europe, in terms of turnover, employment and value-added. Every year, large quantities of primary food products from the agricultural sector are refined into high-quality products (about 70% in Sweden). The industry produces organic waste that needs treatment. For example, high protein by-products are used for animal feed and fats are recovered as petroleum replacements. However, organic by-products are still left for treatment as waste. The organic by-products could be used as substrate for biogas production. Given the potential for biogas to contribute to both nutrient recovery and the mix of renewable energy in the energy sector, it is important to understand how industrial organic by-products are treated today and which conversion options are most beneficial from a resource efficient perspective.

Resource efficiency is a term used more and more frequently. To be able to assess which conversion option of organic by-products resulting from the food and drink industry that are most resource efficient, three different perspectives may be concerned; economy, energy and environment.

In a recent research study, five different areas in Sweden with multiple food and drink manufacturers were studied. All areas had different prerequisites. The aim was to assess if biogas production is a resource efficient alternative for treating organic by-products from the food and drink industry, compared to other treatment methods.

For all the five areas the business as usual were compared to two biogas scenarios. In the business as usual scenario (referred to as Scenario BAU), the organic by-products are either used as animal feed,

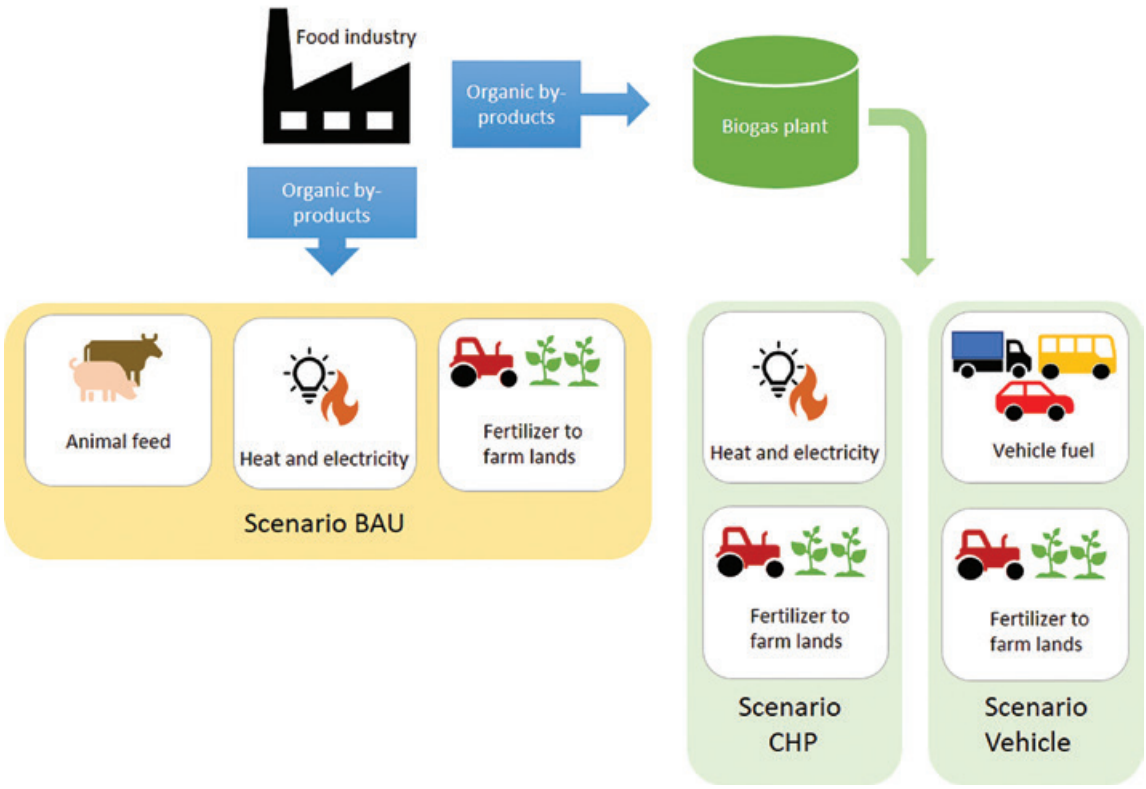


Figure 1. An overlook of the system studied.

incinerated to generate heat and electricity or composted and used as fertilizer. In the two different biogas scenarios, the organic by-products are used for biogas production and the remaining organic matter as fertilizer on farm lands. The biogas is used for either generation of heat and electricity (Scenario CHP) or upgraded and used as vehicle fuel (Scenario Vehicle).

The different scenarios were analyzed from three different perspectives; economy, energy and environment. The environmental perspective was divided into global warming potential (GWP), acidification potential (AP) and eutrophication potential (EP).

To handle the complexity of the electricity mix in Europe, two different electricity systems were used; All electricity from coal condensing power and all electricity from wind power. This to include the whole spectrum of the electricity production in the electricity system, ranging from the production with large CO_2-emissions to small, or no, CO_2-emissions. Hence, the results are presented for each of these electricity systems.

The results show that from an economic perspective, in four out of five areas, it is most preferable to use the organic by-products for biogas production and to use the produced biogas for vehicle fuel. In the fifth area, it is most beneficial to continue as before. This is because the organic by-products in this area have a low biogas potential, compared to the by-products in the other areas. From an energy perspective, scenario CHP is to prefer if the electricity to be replaced is coming from coal condensing power. If the electricity is coming from wind power scenario BAU and/or Vehicle is to be preferred instead in the areas. From an environmental perspective, the two biogas scenarios are to be preferred over the business as usual scenario.

Several factors influence the results: the current treatment methods of the by-products in the different areas, the biogas potential of the by-products, the amounts of by-products available to name a few. The study showed that there is an unused biogas potential of 800 GWh in the studied areas. Compared to the annual production of biogas in Sweden, which is 2000 GWh, the potential for biogas production from organic by-products from the food and drink industry is large. To be able to access this potential the food industry can not be the only actor involved. Cooperation between the public sector and the energy sector is necessary as well as the industry. Biogas production can be a resource efficient treatment method for organic by-products from the industry.

Comprehensive Energy Management Solutions

We address the following Business Challenges

Energy management is no longer an engineering issue, but a question of infrastructure which is based on information and communications technologies. The ultimate success depends on the ability of system and devices to securely and reliably interconnect via a network.

Based in Slovenia, our company is a leading expert in energy monitoring and management; over the last 16 years, our solutions have been recognized by energy efficiency specialists, as well as prominent corporations such as Knauf Insulation, Henkel, ETI, Goodyear, DS Smith, DUOL, and others.

Solvera Lynx's solutions

Solvera Lynx offers innovative solutions for smart energy management (EM) based on in-house developed Software (GemaLogic) and Hardware (ComBox) solutions, also we include in our portfolio wireless LoRaWAN technology. This technology is a better alternative to the classical wired networks due to its long range, unique penetration capabilities, flexibility, easy operation & maintenance, safe & reliable data transfer. **So, we focus on energy saving instead of investing in a wired network.**

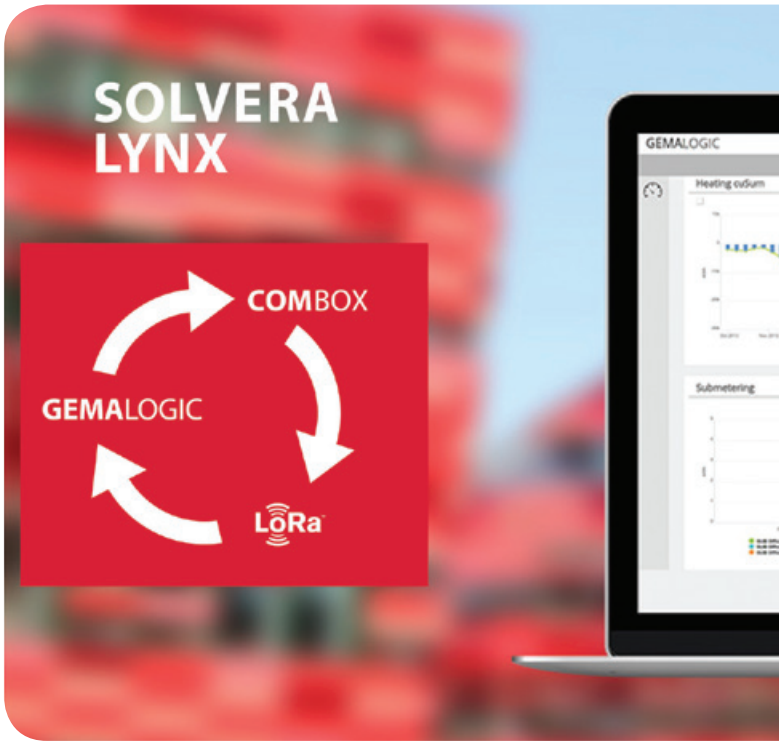
Our software solution is multi-sites, multi-languages, multi-utilities, and fully integrable with production and building management systems; they empower energy managers to fully benefit from Big Data applied to their installations, with advanced analytic techniques, predictive models, and state-of-the-art interfaces.

How does it work?

Transmission of the data from devices, sensors, actuators is done by our innovative wireless long-range ComBox.L® equipment, which has long battery lifetime and suitability for the harsh industrial environment. ComBox.L® sends data to the advanced software platform GemaLogic®, where all the data is gathered, processed and analyzed.

Benefits of implementing Solvera lynx's solution

Implementation of our solution allows companies to accomplish primary EM goals: holistic monitoring of



energy efficiency performance and reduction of energy consumption. Due to the introduction of new energy management system and usage of our innovative software (GemaLogic®) and hardware (ComBox.L®) solutions, the following benefits can be achieved:

- Energy consumption reduction in the 1st year of solution implementation up to 7%
- Analytics to identify consumption patterns, compare historical data, and predict future energy needs
- Reduction of energy losses
- Protection from unexpected energy consumption and alarming in case of energy consumption increase
- CO_2 emission reduction
- Support in ISO 50.001 implementation

Competitive advantages

- Developing software and hardware solution in-house, so we are ready for almost any EM challenge, which requires custom-made, unique, future-oriented solutions.
- The real experience of working in the hardest industrial environments - inhospitable, with high moisture rate, extreme temperature conditions and far-spread production areas

Who can benefit from our solutions?

A wide range of business applications can benefit from our solutions: Energy & Utilities, Telecom, Oil and Gas, Factories, Building and Facilities, Industry, Agriculture, Smart City, Transport, and Logistics.

We have already provided tailor-made solutions for the following projects: smart metering (electricity, gas, water, air renewable energy), volume monitoring (fuel tanks/containers), different types of analyses (air quality, temperature, humidity), tracking/localization and machine status monitoring.

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SOLVERA LYNX
ENERGY MANAGEMENT

EUROPEAN**MOBILITY**WEEK's call-to-action in 2019 is: 'Walk with us!' This brings this year's theme of 'Safe Walking and Cycling' into focus and clearly highlights a mode of transport that is too often underestimated: walking.

Together, walking and cycling are the active modes. Crucial for the future of our towns and cities across Europe. 50 years ago, you only walked or cycled if you could not afford a car. Now, Europe's cities can no longer afford our over reliance on the car. We cannot afford it.

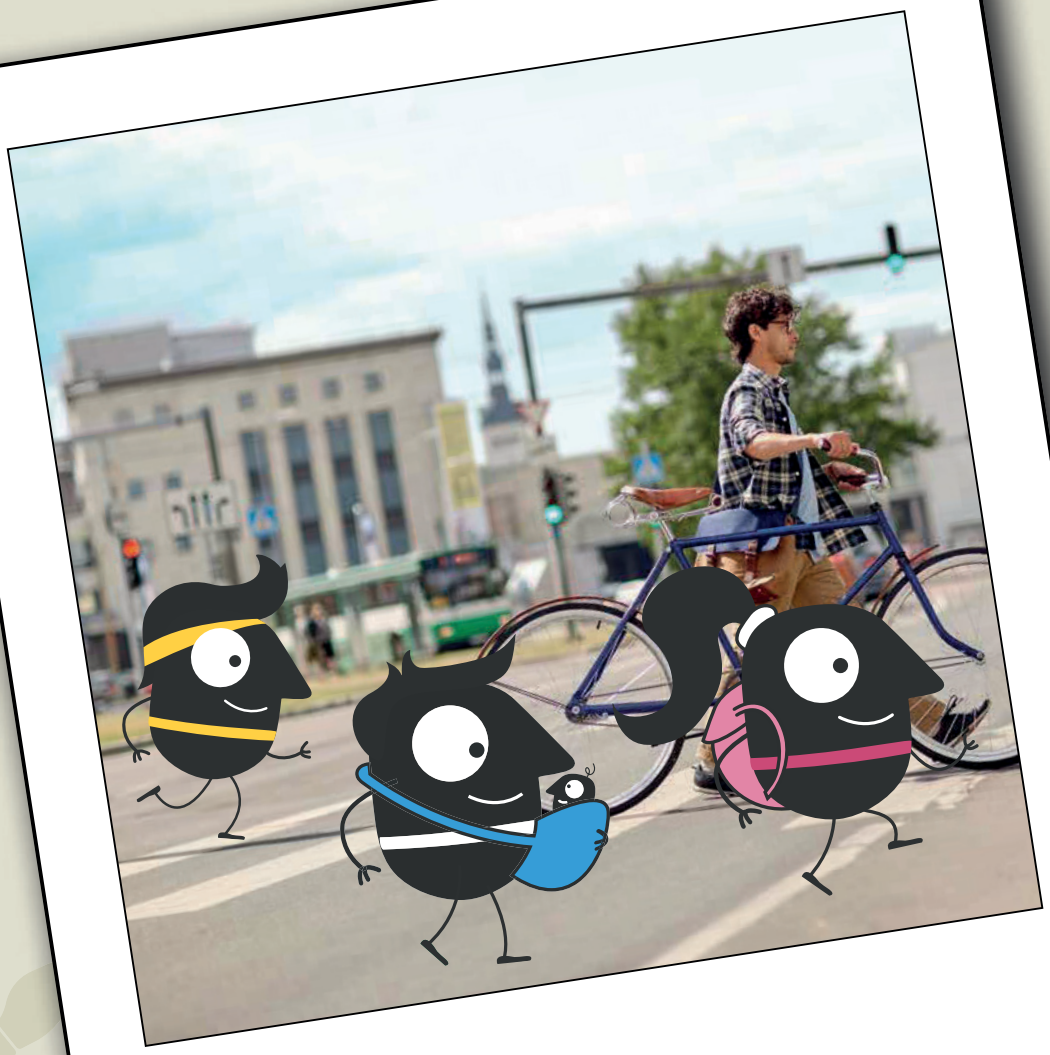
The 2019 EUROPEAN**MOBILITY**WEEK campaign encourages people to choose active modes or combine walking and cycling with public transport. In addition to flexibility, walking and cycling have many other benefits, such as: social and economic accessibility, reliability, no emissions and a positive impact on health.

Most of all, perhaps, cities where active mobility predominates are transformed.

To secure all these advantages, walking and cycling must be safe and look safe to the public. Local authorities should provide road infrastructure to make pedestrians and cyclists 'vulnerable road users' no longer, to enable them to move safely and feel safe in our cities.

EUROPEAN**MOBILITY**WEEK

16-22 SEPTEMBER 2019



Walk with us!

#mobilityweek

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