SPRING 2023

european energyinnovation

Connecting Europe's Stakeholders in Energy and Transport

SUSTAINABLE AVIATION FUELS

WATER EFFICIENCY

DIGITALISATION OF THE ENERGY SYSTEM

ELECTROMOBILITY

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EPP Group

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European Alliance
to Save Energy

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Directorate-General for
Communications Networks,
Content and Technology,
European Commission

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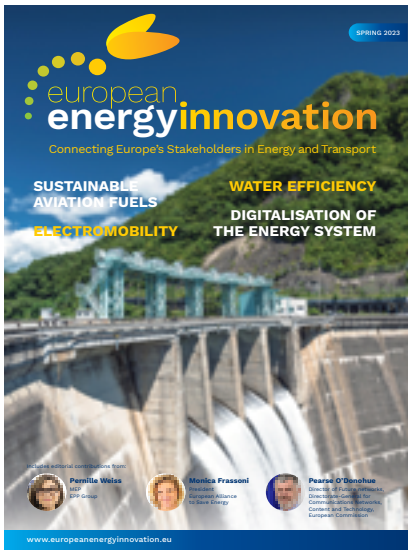

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PORTSTRATEGY INSIGHT FOR PORT EXECUTIVES

GREENPORT INSIGHT FOR PORT EXECUTIVES

Foreword

One year ago, as we reacted with outrage and horror to Russia's brutally illegal invasion of its neighbour, we were only beginning to appreciate its potential consequences for the European economy, and even for its way of life. No doubt these factors featured heavily in Moscow's calculations.

Since then, Ukraine's ingenuity, resilience and resolve under its charismatic and inspirational leader have become a beacon of hope, while, bogged down in the 'meat grinder' in the East and forced to retreat in the South, Moscow's "Special Military Operation" has failed spectacularly as Leopards and HIMARS balance economic and humanitarian aid in our response to the expanding catalogue of Russian atrocity.

Now, the winter heating season is almost behind us. As we begin to absorb the far-reaching effects of higher energy prices upon our economies, we must not allow ourselves to be distracted from Climate Change, the slow-motion catastrophe looming over us all. Even as last Summer's dry rivers, record temperatures and wildfires, and 2021's record flood events begin to fade from the collective memory, that fight is far from over; and neither is the conflict in the Donbas.

For good reasons, as it turns out, water features prominently in this issue; and Pernille Weiss MEP challenges us to give it us much attention as we do to energy. The OECD forecasts a 55% increase in global demand, and as climate change causes more droughts in the South and more floods in the North, we need answers to these challenges. Smart management is one, and Weiss argues the crucial role of industry, pointing out that ready-made solutions already exist, and that scaling up Danish technologies would also offer significant energy savings. The legislative approach involves the Urban Waste Water Treatment Directive and the Industrial Emissions Directive, which, she argues, need to balance the needs for a water-smart society with those of the economy.

"Probably two of the most essential, interlinked, and precious resources in our daily lives." So says Monica Frassoni as she explores the water-energy nexus in more detail. Commenting that advanced technologies such as AI and connected sensors can optimise the energy consumption of wastewater treatment, she adds that more nature-based solutions, such as green roofs and green spaces in urban areas, can increase retention and reduce runoff. She also advocates digitalisation within the manufacturing, energy and agriculture sectors to promote water re-use, and a strong policy framework to incentivise water and energy efficiency and enable deployment of these solutions at scale. Adding that treated waste water contains valuable renewable energy in the form of heat simply reinforces her call for Europe to adopt a more systemic and holistic approach: the long-awaited European Water Strategy.

On that theme, Pearse O'Donohue explains the Commission's approach to digitalising the energy system. Decarbonisation of the sector is one goal, and O'Donohue explores the issues in a series of questions covering investment in smart grids and digital solutions, cybersecurity, energy consumption of the ICT sector and, perhaps crucially, funding options, given that the process will require investment of some €584 billion during this decade.

Decarbonisation of the aviation sector often features on these pages, also for good reason. Dietmar Bloemen reminds us that growth in traffic is outpacing efficiency improvements and driving the sector's emissions upward. Sustainable fuels (SAF) are a key element of reducing emissions in the near term, and Bloemen explains their climate benefits before going on to examine the safety aspects of blending SAF with conventional fuel. He calls for additional regulatory measures to support SAF adoption because the industry is at a very early stage of development

EU dependence on Russian hydrocarbons had been increasing steadily, even as supply was being throttled just before the tanks began to roll. The past year has taught that energy security for the state, and energy poverty for its citizens, represent both danger and opportunity: not only in the geopolitical sense, but also in the context of climate change. But record growth in wind and solar generation have helped renewables to produce a quarter of EU electricity since the war began, saving 70 bcm of gas imports, worth an estimated €99bn. Gas, at least, that has not been burned this year.

And there is more for you to read inside...

Michael Edmund
Editor

European Commission

20-22 JUNE 2023

EUROPEAN SUSTAINABLE ENERGY WEEK

Accelerating
the clean energy transition -
towards lower bills
and greater skills

#EUSEW2023
ec.europa.eu/eusew

STRENGTHENING THE CLEAN ENERGY COMMUNITY

TAKE PART IN EUSEW

Let's shape Europe's energy future together! This year's hybrid, interactive event, taking place both online and in Brussels, is great for getting together, sharing ideas and know-how, and building alliances to drive forward the energy transition.

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Join sessions gathering industry representatives and policymakers, EU project partners, entrepreneurs and members of civil society to discuss independence, security, recovery and growth through renewables and energy efficiency. Registrations open in April 2023.

VOTE IN THE EUSEW AWARDS

Take part in the online public vote from 10 May-11 June and discover who will take home the Awards for Innovation, Local Energy Action and Woman in Energy.

CONNECT WITH INSPIRATIONAL ENERGY PROFESSIONALS

Visit the Energy Fair in Brussels to meet other professionals having an impact on renewables and the clean energy transition, learn about their projects and exchange the latest insights in the field.

ORGANISE OR PARTICIPATE IN SUSTAINABLE ENERGY DAYS

Register your Sustainable Energy Day or discover online and physical events taking place around the world, engaging local communities between March and June.

EUROPEAN SUSTAINABLE ENERGY WEEK 2023 17TH EDITION

Organised by the European Commission, the European Sustainable Energy Week (EUSEW) is the biggest annual event dedicated to renewables and efficient energy use in Europe.

On 20-22 June 2023, the 17th edition of EUSEW takes place in a hybrid format, with both participants and speakers able to attend online and onsite, under the theme: 'Accelerating the clean energy transition - towards lower bills and greater skills'.

Since 2007, EUSEW has grown into a vibrant community bringing together a wide range of energy stakeholders, which meets annually to debate the latest developments and ideas in the sector.

Do not miss this year's high-level Policy Conference, the EUSEW Awards or the fourth European Youth Energy Day, as well as opportunities to meet innovative clean energy projects at the Energy Fair.

Let's talk more about water!

By Pernille Weiss, MEP, EPP Group (pictured)

Water is vital for life and without it the world as we know it would not exist. However, as a finite natural resource, water is increasingly facing major challenges. Notably, water demand is projected to increase by 55% globally between 2000 and 2050 by the OECD to satisfy the needs of an ever increasing urban population. Meanwhile, climate change in Europe is expected to cause more droughts in the South and more floods in the North. The Green transition thus requires clever water management. It becomes of outmost importance to manage and use water intelligently. In this context, the EU must become water-smart – that is to recognise the true value of water – as soon as possible.

Industries have a crucial role to play in this equation: the industrial water sector in Europe accounts for 50 percent of water withdrawal in the continent. The most critical industrial sectors are also the ones that consume the most water (energy, semiconductors, raw materials, pharmaceutical, etc.). Therefore, water resources in industries need to be utilised more efficiently. This actually represents one of the most untapped potential of the green transition. By doing more with less, the industry can become a key catalyst in mitigating the water challenges efficiently and sustainably.

Being resource-efficient will not only reduce our impact on the environment, on biodiversity, and our climate, but will also help to minimise the risks of water shortage. Moreover, this approach can strengthen our competitiveness while positioning the European continent as a role model globally.

The money needed to invest in these changes should always be put into perspective: the cost of taking actions for business is estimated to five times lower than the cost of water risks. It remains, however, easier said than done, and we must not neglect the need to develop sustainable roadmaps for each of the relevant industrial eco-system.

One of the most critical aspect regarding water efficiency is that ready-made solutions already exist. European companies are global leaders in water technologies and Denmark, especially, is home to some of the world's most water-efficient firms whose products (such as pumps, valves, and temperature control) can help reduce water consumption in industries.

In fact, the Danish water sector has set an aspiring goal for itself: to become energy and climate neutral by 2030. All of this is making the European continent well-placed to develop and showcase the innovations needed for our future water-smart society.

With many of the solutions at hand, the time is now ripe to scale up these solutions. Extending the application of these technologies and exporting them to other countries would bring many added benefits. For instance, a report from 2022 concluded that the "global spread of Danish waste water technology and solutions can provide energy savings equivalent to the current European electricity production with coal".

Secondly, and more broadly, the topic of water needs to be included higher in the EU political agenda. Given its importance, our considerations for water should be on a par with energy. Unfortunately, the value of water remains too often under the radar and this situation can no longer continue.

As the chair of the European Parliament´s Water Group, a grouping of parliamentarians passionate about the topic of water that regularly meets and organise events in the Parliament, I am proud to participate with my colleagues in raising the profile of water in the EU agenda.

We do so by providing a space where we, policy-makers, meet with relevant industry stakeholders to discuss the concerns and priorities of the sector. This type of exchanges is particular important if we want to shape an adequate and informed legislation that is well in tune with the latest development of the sector.

Last month, we had the opportunity for instance to engage with several Danish multinational companies (Grundfos, AVK, Rambøll, NIRAS, Carlsberg Group) and understand how the industry could mitigate and overcome the challenges of water in a sustainable and efficient way.

Another way to put water on top of the EU agenda is to include strong references to water efficiency in two (on-going) important environment legislations: the Urban Waste Water Treatment Directive, which aims to make sure wastewater is treated equally across EU Member States; and the Industrial Emissions Directive, which aims to better regulate pollutant emissions from industry.

Both legislations need to work towards the development of a holistic approach that leads us to have a true

water smart society without harming our economy. We must succeed in becoming both water smart and make our economy grow at the same time.

Engraving the concept water-energy nexus in EU policy is also paramount. Energy and water systems are interdependent and an integrated approach is needed to address the present and future challenges and opportunities.

A final point I would like to highlight is the importance of using digital technologies and data-centric solutions to better manage water.

The Green and Digital transition work hand in hand, not apart. Using data in this context is key to improve resource efficiency, while also reducing CO_2 emissions, accidents and leakages.

So let's talk more about water, when we discuss climate and energy.

REVEAL – Revolutionary energy storage cycle with carbon-free aluminium

By Zuzana Taťáková FENIX TNT, Páll Árnason Taeknisetur, Michel Haller OST

Insight

Renewable electricity and heat can be produced cheaply today and short-term storage solutions for evening out mismatches between production and demand are available at low cost. Essentially, there would be enough energy if the sun could be used as a virtually unlimited source. However, most of the sun's energy comes in the summer but is needed in the winter.

In the cold season, the demand for heat is highest because the sun is not shining and while electricity from photovoltaics is cheap, it only comes during the day, and it comes less in winter. While balancing from day to night is not that difficult, technologies for shifting from summer to winter and storing renewables for longer time spans of months or seasons are scarce and costly - thus not widely used yet.

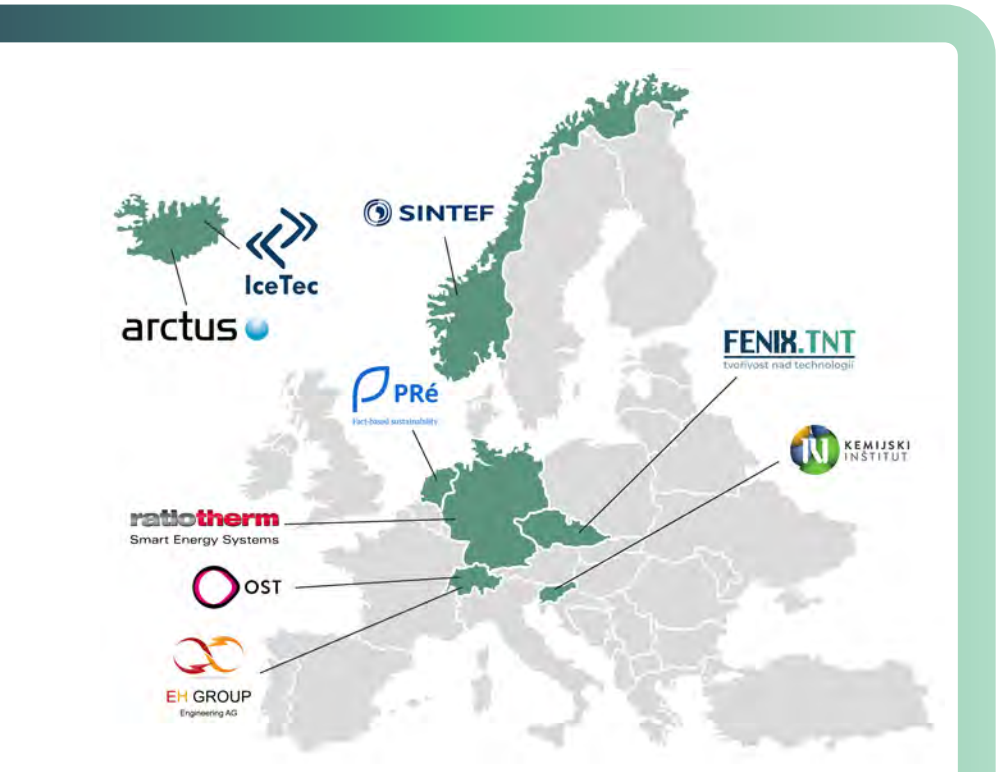
Power-to-gas solutions are being propagated: Water is split into oxygen and hydrogen by electrolysis, i.e. with electricity, and the hydrogen is stored. But hydrogen has a very low energy density. Per kilogram, hydrogen has an interesting energy density, but it is a gas, per volume the energy density is extremely low. Therefore, hydrogen would have to be put under enormous pressure of 300 or 600 bar, liquefied, or converted to hydrocarbons at considerable expense in order to store it. That would lead to the additional effort, higher costs, and a loss of efficiency.

The REVEAL project develops a game-changing and unique solution to this challenge, using the conversion of aluminium oxide into aluminium metal (Power-to-Al) in an environmentally friendly way to store renewable energy and produce a "renewable fuel" in the form of aluminium.

Aluminium does not have a very good reputation ecologically - because it needs a lot of energy in order to first produce aluminium oxide from the raw material bauxite and then aluminium.

However, if the energy put into it is firstly renewable or 'clean' and secondly stored in the material and not lost, then that is exactly the outcome desired: A material into which a lot of energy can be put per kilogram or per cubic metre and from which this energy can be obtained back later.

If aluminium is produced with today's technology, then about half of the energy used in production is stored chemically in the aluminium. If the



SEASONAL ENERGY STORAGE CYCLE
developiment of breakthrough components and solutions that are needed for an AI electrochemical energy storage cycle

POWER-TO-AI (STORAGE CHARGING)
based on renewable electricity without emissions of greenhouse gases from the AI smelter (POWER-TO-AI) process

AI-TO-ENERGY (STORAGFE DISCHARGING)
emission free AI-to-Energy

LIFE CYCLE AND ECONOMIC ANALYSIS
for better economic and environmental performance

aluminium is oxidised later, then this energy is released again.

Reveal Solutions

This ground-breaking technical solution will enable to store a large amount of energy with an unmatched energy storage density of over 15 MWh/m³ at an attractively low cost, without losses and with lower environmental impact than today's solutions. The easily transportable energy vector can be used for heat and hydrogen, or electricity production, wherever and whenever needed, in scalable units from a few kW to the MW range.

High-density storage solution will enable it to cover energy demands with flexibility also in small units and off-grid situations, and – above all – in seasons where the demand is much higher than local renewable production could possibly cover.

Therefore, with the emerging technology of carbon-free reduction of aluminium oxide to aluminium in combination with the release of energy from an aluminium storage vector, this project will provide one of the missing pieces of the puzzle for a climate neutral Europe.

About REVEAL Project

REVEAL is a collaborative research project co-funded by the European Union's Horizon Europe Climate, Energy and Mobility Programme under Grant Agreement 101069492 and by the Swiss State Secretariate for Education, Research, and Innovation (SERI). The project budget is 3.6 m€ and the consortium is made up of nine partners from seven different European countries.

Approach

The main innovation of the REVEAL project is the introduction of a new route of Power-to-X: the energy efficient (65%) and carbon-free aluminium electrolysis cells and the use of the generated renewable aluminium as fuel to provide heat and electricity.

Project ID:	101069492
Website:	www.reveal-storage.eu
Start date:	July 2022
Duration:	48 Months
Project coordinator:	Taeknisetur ehf.
Technical coordination:	Eastern Switzerland University of Applied Sciences (OST)
Contact email:	info@reveal-storage.eu

Funded by the European Union

The Swiss contribution is supported by the Swiss State Secretariate for Education, Research and Innovation (SERI) under contract number 22.00043

REVEAL

The water-energy nexus

Connecting water saving, energy efficiency and the reduction of emissions.

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

Water requires energy. Each time we abstract, move, clean, heat and cool water we need energy. And when we generate energy, we need water. Water and energy are probably two of the most essential, interlinked, and precious resources in our daily lives. In our current climate and energy crisis unleashing the potential of the water-energy nexus will drive substantial water and energy savings, reducing emissions and increase the competitiveness of European industry. The great thing is that we already have the technologies and solutions to simultaneously save water and energy.

We can, for example, reduce the energy needs and optimise the consumption of wastewater treatment plants deploying digital tools such as artificial intelligence, cloud solutions, advanced software and connected sensors. Data transparency and advanced data analytics allow for a holistic management of wastewater collection and treatment systems resulting in improved treatment effectiveness, reduced failure of infrastructure and leakages, limited overflows of the sewer system and reduced capital investment requirements into unnecessary new infrastructure development and energy consumption.

Climate change is the cause of more and more extreme precipitations. Impervious surfaces in urban areas reduces water infiltration putting enormous pressure on the urban wastewater infrastructure and increasing energy consumption of treatment facilities. In this context, nature-based solutions for decentralised stormwater management such as green roofs and green spaces in urban areas promote natural water retention and detention reducing runoff, sewage overflow and the energy cost related to the treatment of increasingly big quantity of rainwater. These are mature and proven technologies that deliver energy savings.

Other areas where the nexus holds the potential to generate large-scale energy and water savings is manufacturing, energy and agriculture sector. Water is critical to industrial production. There are major economic sectors ranging from beverage and food processing to automotive, farming, chemical and energy production in which water is indispensable. With existing technologies, we can address the pressing issue of water scarcity promoting water reuse techniques. Again, digitalisation plays an important role to ensure that water and energy efficiencies help production processes and increase competitiveness thanks to costs reductions while help mitigating climate change.

A strong policy framework is needed to incentivise water and energy efficiency and enable the deployment at scale of these solutions. The water-energy nexus should be better reflected in legislation, and lawmakers should fully consider the benefits stemming from water efficiency as a key driver to delivering energy savings. At the European Alliance to Save Energy we have pioneered the policy debate around this topic and several policy developments are currently underway.

The revision of the EU's Energy Efficiency Directive, currently in its last phase of negotiations, will hopefully acknowledge the water-energy nexus and encourage industry to monitor water and energy consumption and assess water efficiency opportunities as part of their energy audits. The legislators could have been much more ambitious but the Directive is a step in the right direction.

The revision of the Urban Waste Water Treatment directive is following its ordinary legislative process. The European Commission proposal has addressed the issue. More will have to be done to ensure that the application of the 'Energy Efficiency First' principle is the first step on the path to energy neutrality of waste water treatment plants by 2040. Increased energy efficiency can drastically reduce the facilities' energy needs and accelerating the integration of renewable energy sources. Moreover, treated wastewater carries a valuable source of renewable energy in the form of waste heat that can be recovered. The proposal introduces also the obligation to establish locally integrated urban wastewater management plans to tackle urban runoff and storm water overflow suggesting prioritising preventive measures promoting natural water retention, and measures increasing green spaces over the creation of new infrastructures. There are certainly synergies to exploit with the recent proposal of a Nature Restoration law that proposes

mandatory urban green targets for European cities.

The revision of the Industrial Emission Directive is also ongoing, and several inputs received from stakeholders call for the legislator to systematically consider water and energy savings as a key driver for emission reductions.

Technological solutions already exist, they are tried and tested and can make a profound difference to solve water and energy challenges and to make long-lasting impacts. We need to seize this moment to promote dialogue and reflection around the water-energy nexus. It is time for Europe to have a more systemic and holistic approach and design a long waited European Water Strategy that aggregates stakeholders and set goals and direction for the next years.

EIRIE for your R&I needs to support your endeavours to lead the energy transition

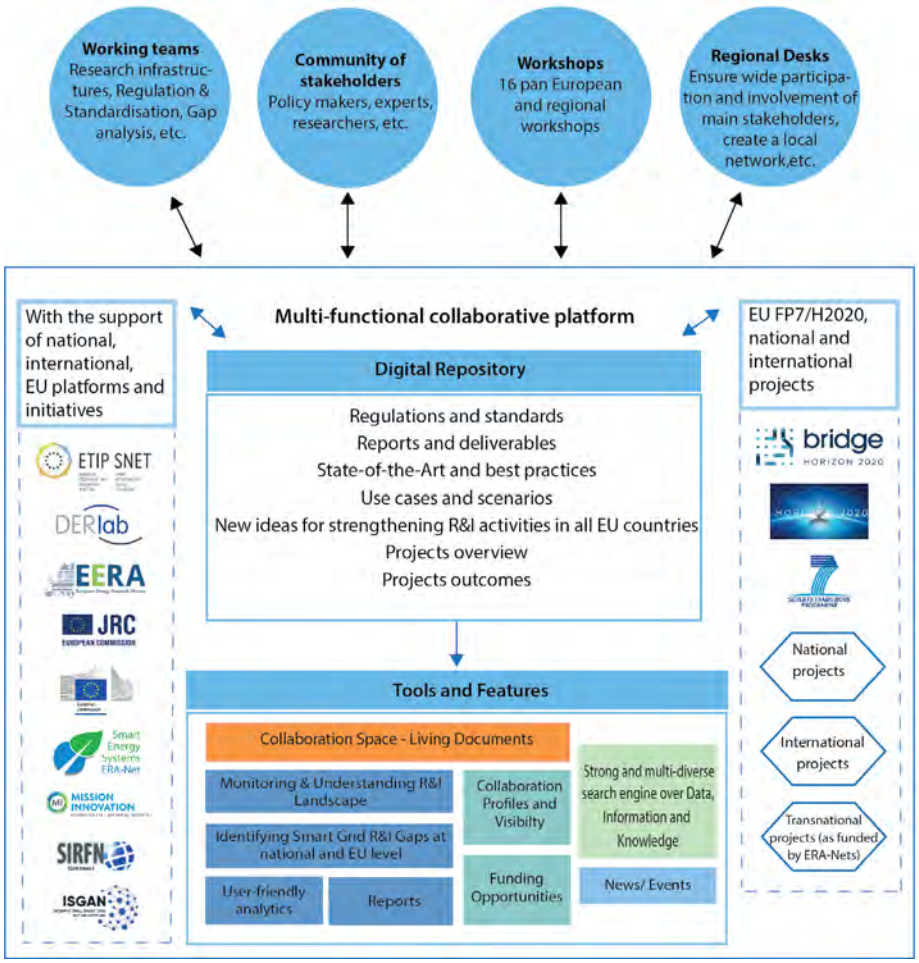
Discover EIRIE (European Interconnection for Research Innovation & Entrepreneurship), developed within the Horizon 2020 PANTERA project, and find out all the opportunities this interactive multi-functional platform can bring, simply by logging in with your EU credentials. For ultimate benefit you only need to raise activity in areas that provide you with real value and your authorization level will rise to the required level!

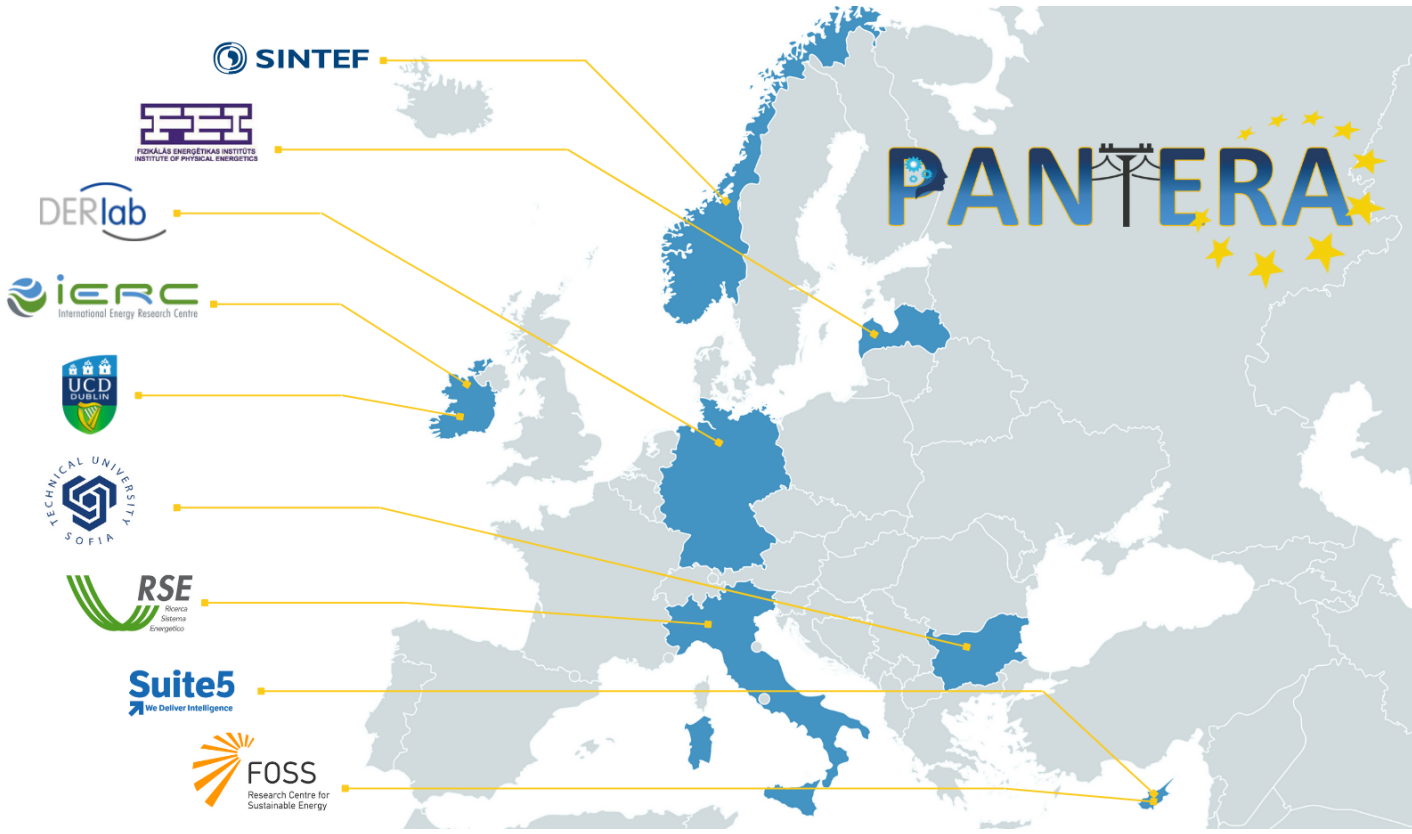
The key objective of the EIRIE platform is to connect and bring together the European Union's Research & Innovation community in smart grids, storage and local energy systems, in one place, to enable collaboration, increase wider interest and give access to all the resources needed to play an active role within the European research community.

With PANTERA and especially the EIRIE platform, we bridge the gaps that currently exist in the energy field in Europe between Member States, by bringing through a single point of access, the benefits and attractiveness of successful partnerships and R&I, being national, regional or European.

EIRIE openly facilitates collaboration between researchers, R&I organizations, and policy makers, building a research database which aims at levelized investments in Smart Grids, Storage and Local Energy Systems throughout Europe, leaving no one behind. Users enjoy an easy access to information on potential funding and consortium building, projects data collection (results and outcomes, best practices, reports and deliverables, etc.), standards and regulations, all of these searchable via an easy-to-use dynamic search tool. Through EIRIE, collaboration is enriched through the Confluence[1] tool, which is seamlessly integrated within the EIRIE platform.

Surveys carried out to assess the main barriers limiting the funding and development of R&I in the energy field revealed: a lack of responsive networking facilities, limited monetary & human resources and limited national policy in support of R&I activities. The PANTERA project addressed all these barriers, either via direct activities such as the organisation of workshops with the participation of local stakeholders, or through the rich functionalities of the EIRIE platform. The success and sustainability of EIRIE is





ensured through the constant support of DG Energy, JRC (EC Joint Research Centre) and ETIP SNET (ETIP Smart Networks for Energy Transition). Indeed, EIRIE has a future to serve you all the way! It is hosted on the servers of JRC, ensuring long-term operational support through a service contract financed by DG Energy.

The voice of Stakeholders

"The approach adopted by the PANTERA consortium is highly appropriate and generates useful services to the R&I community in Europe. The services included on the EIRIE platform will enable the R&I community of low activity countries to get involved and build successful collaborations to raise their contribution to the R&I objectives of their countries and EU." João Peças Lopes, INESCTEC Porto.

About PANTERA

PAN European Technology Energy Research Approach (PANTERA) is an EU H2020 project aimed at setting up a European forum composed of Research & Innovation stakeholders active in the fields of smart grids, storage and local energy systems, including policy makers, standardisation bodies and experts in both research and academia, representing the EU energy system.

It is PANTERA's vision to create, through the planned multi-functional collaborative platform, a reference operational point to:

- Unify and harmonize European activity
- Incentivize further investments in smart grids
- Support access to exploitable results that can spark further work and cooperation

Get in touch with us!

https://pantera-platform.eu/

Email: contact@pantera-platform.eu

Find us as "PANTERA EIRIE Platform" on LinkedIn, Facebook, Twitter and YouTube.

1 https://www.atlassian.com/software/confluence : Confluence is your remote-friendly team workspace where knowledge and collaboration meet.

Social Safeguards: The Key to a Successful Renovation Wave

By Marine Cornelis, Executive Director and Founder, Next Energy Consumer

The Renovation Wave aims to drive forward EU climate and social commitments by improving energy efficiency and sustainability in homes whilst protecting the most vulnerable. Regrettably, in some areas, renovation policies are causing "renovictions", as retrofits are used as a pretext to raise rents and evict tenants and low-income homeowners. Implementing social safeguards is imperative to ensure the Renovation Wave benefits the most disadvantaged and energy-poor. How can EU and national policymakers make this happen?

The European Renovation Drive: Addressing Energy Poverty and Social Exclusion

With buildings in Europe accounting for a staggering 40% of energy consumption and 36% of CO_2 emissions, it is no surprise that the European Renovation Wave is being hailed as a crucial step forward. However, as the energy price crisis has only exacerbated the already dire situation of energy poverty, a condition closely linked to poor quality housing, affecting more than 34 million European households, collective efforts must go towards improving the energy efficiency of buildings and prioritising the needs of the most vulnerable.

Ineffective Policies and Renoviction Risks

While well-intentioned, many current policies and programs tackling housing renovation have proven costly, discriminatory and ineffective. For instance, in Germany, Italy and Bulgaria, untargeted financial incentives have led to delays and inflation. In Slovakia or Croatia, the most vulnerable are often excluded from renovation programs due to eligibility criteria and documentation issues. Meanwhile, in Greece, a focus on ownership rather than rental properties leaves many people in rental accommodation ignored.

In the absence of low-income and tenant protection measures, speculation and financialisation of the housing sector are leading to social exclusion, as seen in the sharp rise in homelessness in Ireland in 2022. Without sufficient financial incentives, property owners may not undertake renovations without passing the costs onto tenants, leading to "renoviction" and displacement of low-income homeowners and tenants. Other cities with high real estate demand, such as Paris, are particularly affected by this trend, displacing tenants and low-income homeowners and contributing to housing insecurity and urban gentrification.

Lack of financial incentives can also result in renoviction. Property owners may not have enough financial incentives to undertake renovations without passing the costs on to tenants, including those in social housing (as seen in Lodz, Poland). Low-income owner-occupiers are also vulnerable to the harmful effects of poor renovation policies. In some cases, they may be forced to undertake costly renovations to meet new energy efficiency standards, leading to over-indebtedness. Others may be forced to sell their homes due to the costs associated with renovating multi-apartment buildings (as seen in Estonia).

Social Safeguards: Essential for Housing Policies

We must ensure our renovation efforts prioritise social justice and improved living standards. To do this, we must implement social safeguards to protect the rights of tenants and property owners and prevent renovictions. This includes prioritising the renovation of the worst-performing dwellings of those in energy poverty and temporary accommodation, such as hostels and shelters. Fratello Sole in Italy, for example, focuses on renovating hostels for marginalised populations.

Private Rental Sector

Investing in a better understanding of the private rental sector and assessing the effectiveness of tenant protection laws and rent control measures is crucial. These measures, such as the right to request repairs and improvement and rent control - through legislation or collective agreements - can help protect tenants from the adverse effects of renovations and the threat of eviction.

Financial Tools

Financial tools such as 100% subsidies and low-interest loans should be provided to support low-income owner-occupiers, keeping remaining costs close to zero. For landlords, instruments could be linked to rent cap guarantees. Certification schemes for responsible renovations could also be introduced to recognise and reward property owners who undertake renovations in a reliable, tenant-friendly manner.

Promoting Social and Community Housing

Policies and programs must prioritise community housing, as seen in Vienna, Austria, putting people before profit. To ensure sustainability and affordability, it is essential to think beyond the building and involve all sectors and policy areas, from regulation to construction, taxation, environmental, energy, and social policies.

Conclusion: Renovating for affordability and sustainability

In conclusion, while the European Renovation Wave has the potential to improve energy efficiency and address energy poverty, we must implement adequate social safeguards to prevent "renovictions" and ensure the affordability and sustainability of housing for the most vulnerable households. The EU's Affordable housing initiative is a major step forward. But by going further and including living conditions in the energy performance certificates, boosting the implementation of the right to housing presented in Article 31 of the European Social Charter, and providing access to affordable performant renovation for low-income households, we can help secure a brighter future for all.

Recommended links

1. How to avoid a Renoviction Wave, Report on the social impacts of the Renovation Wave (PDF) Marine Cornelis for FEANTSA, December 2022
2. 7th Overview of Housing Exclusion in Europe 2022, FEANTSA, June 2022
3. #BPIEClimateConversations, Housing affordability: Who's responsible?, BPIE, June 2022

About the author

Marine Cornelis is the executive director and founder of Next Energy Consumer, a policy consulting firm specialising in the social aspects of energy and climate transitions. Her work brings together the demands and perspectives of civil society, scientific groups, corporations, ombudsmen, regulators, and governments. She works with and advises customers in Europe, Africa, and Mexico. Before founding Next Energy Consumer, Marine worked for many years in Brussels as a consumer rights advocate. Marine is an experienced public speaker and policy shaker who is passionate about energy justice and community development. She is one of the first Ambassadors for the European Climate Pact.

Marine Cornelis is a digital ambassador of the European Sustainable Energy Week, of which European Energy Innovation is a media partner. Registrations will open in April 2023.

Climate-proofing Europe's power se extreme weather while reaching net

By Kristian Ruby (pictured), Eurelectric Secretary General

A few months ago Italy was hit by a disastrous mudslide that killed eleven people and tore apart the island of Ischia. The tragedy was caused by exceptionally heavy precipitations, just like the ones that flooded Germany and Belgium last year, causing more than 200,000 customer outages and 220 deaths. While the list of extreme weather events across Europe could go on and on, what is most worrying is that their recurrence is rapidly growing.

The Intergovernmental Panel on Climate Change (IPCC) projects a global increase in climate hazards over the next ten years with a 50% increase in heavy precipitation, a doubling of droughts, and a quadrupling of extreme temperatures.

No European country will be spared from these "climate attacks", nor will their power assets. The electricity system in Europe is indeed facing unrivalled pressures. COVID-19 challenged how staff and systems worked together while Russia's invasion of Ukraine sparked one of the harshest energy crises to date.

Climate change and extreme weather are adding a critical component to an already complex map of risks that every utility and system operator needs to deal with. We have seen hundreds of hectares burn, changes in precipitations, droughts, lost livelihoods, and lost lives. This is a structural shift in the weather patterns of Europe where extremes will become much more frequent in the future than they have been in the past.

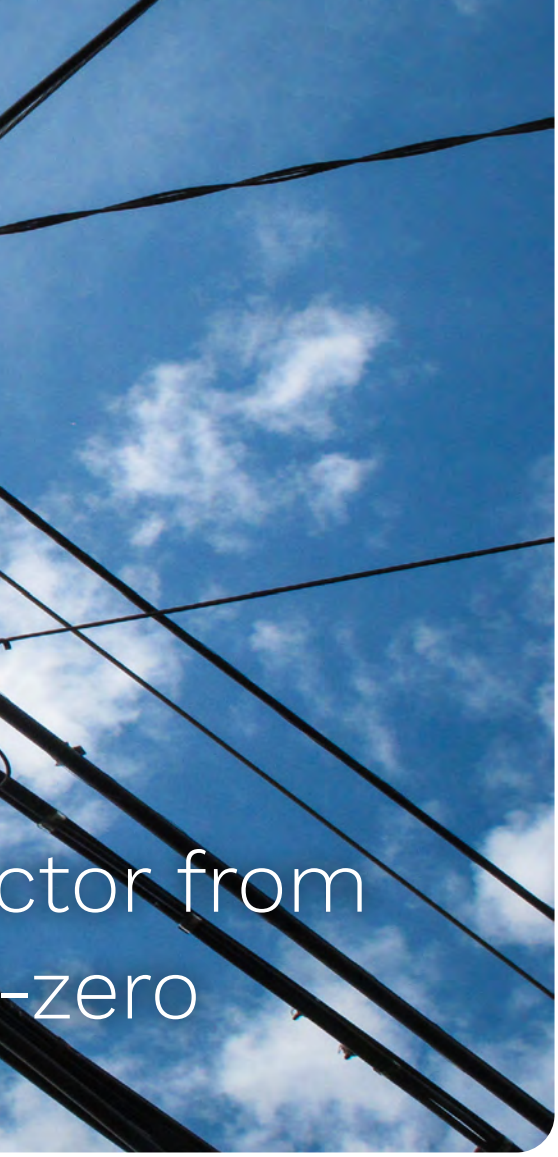
Record-breaking heat waves and droughts significantly lowered water levels during the past summer. This reduced hydropower generation and affected nuclear and thermal plants' cooling capacities from France to Sweden.

Smoke and debris caused by fire weather can reduce solar and wind farms' output, whereas, during the winter, cold spells and snow sleeves can disturb wind turbines' operation and cause undercooling. At the same time, severe storms and floods increase the risk of overtopping hydropower dams and of forcing wind turbines to shut down to prevent wear and tear.

These climate disruptions are even stronger on distribution grids due to their vast territorial exposure details Eurelectric's Resilience study.

Faced with these weather storms, the power system is already employing several adaptation measures such as physical hardening, network uprating, preparedness plans, backup systems, and digital tools.

Yet, rapidly growing climate hazards and Europe's renewed push for massive clean and renewable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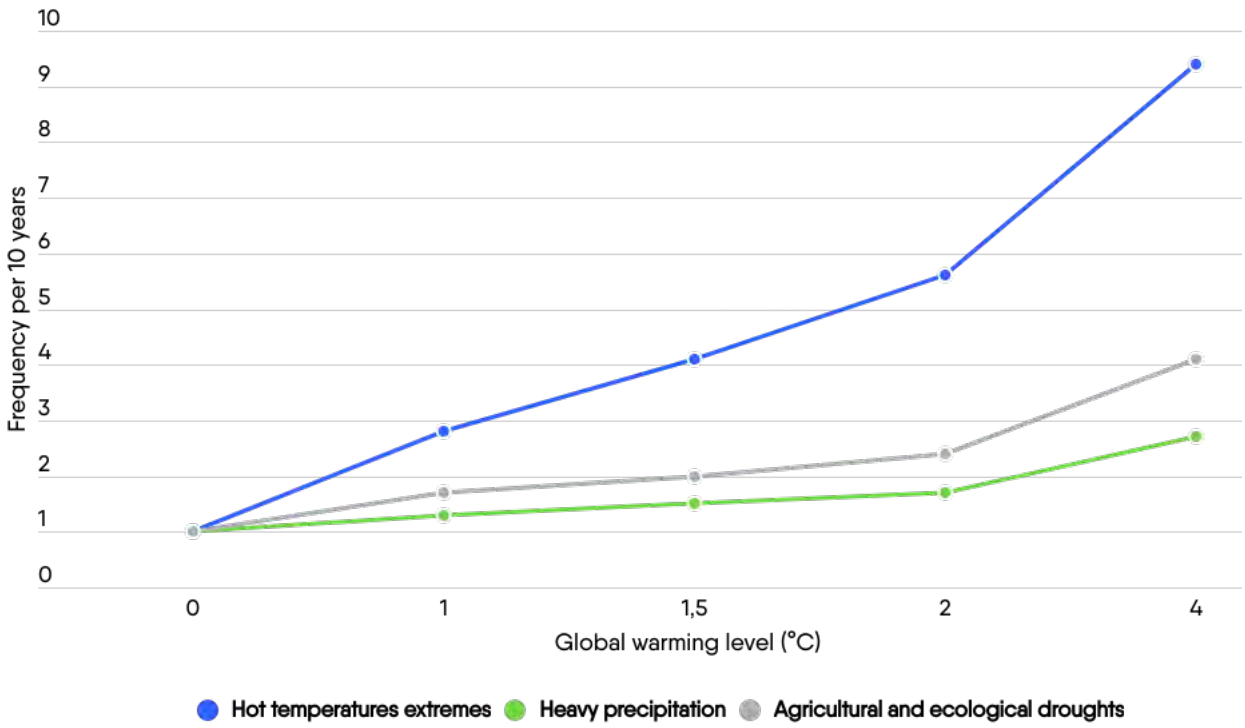
10
9
8
7
6
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Frequency per 10 years
0
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1,5
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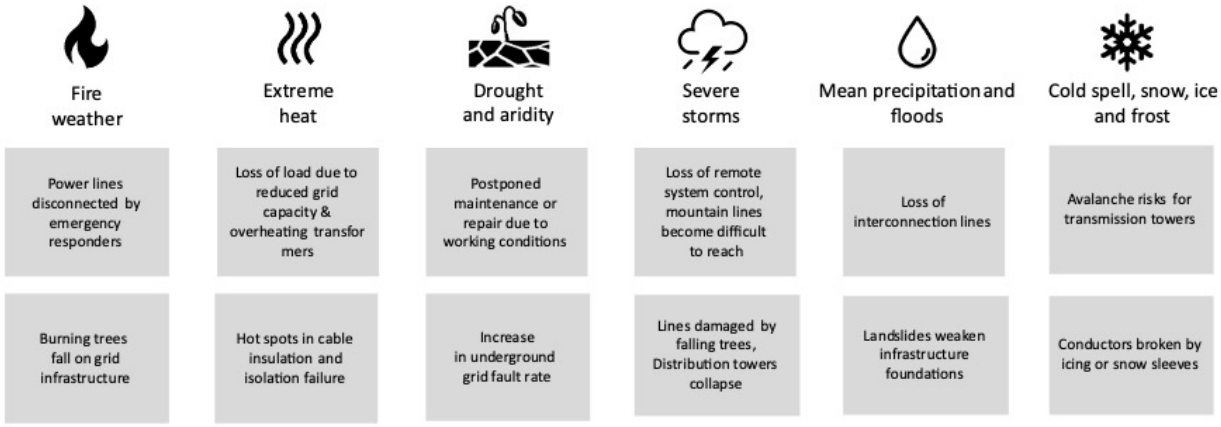
Global warming level (°C)
Hot temperatures extremes
Heavy precipitation
Agricultural and ecological droughts

Exposure of transmission and distribution assets in Europe



The Coming Storm – Building electricity resilience to extreme weather, produced by Eurelectric with technical advisor EPRI

electrification to reach net zero demand stronger action. Electrification rates must indeed jump by eleven points by 2030 to meet the EU's decarbonisation targets, shows Eurelectric's Power Barometer. A reliable and climate-resilient energy system is an essential enabler of this much-needed electric take-off.

Will frequent blackouts and massive repair costs become the new norm in Europe?

Preventing such grim scenarios demands power system operators, utilities, regulators, and national authorities to embrace stronger resilience measures. It is urgent to turn theory into large-scale investments, actionable regulatory frameworks, and integrated climate adaptation plans.

Over the past decade, extreme climate-related events have caused over €145 billion in economic losses across the EU. If prevention is better than cure, then investing in more adaptation measures now would avoid much higher repair costs later. This is especially true for investments in grid resilience, as distribution networks are the backbone of our electricity system yet one of the most exposed to extreme weather and external attacks.

Grid investments should amount to some €400 billion by 2030, out of which 8% (€32 billion) would be for resilience. This share is set to grow as the world is not on track for the 1.5°C scenario. However, this cost should be partly balanced out by the increase in cheaper renewables and flexibility services which lower energy prices.

Since investments require regulators' seal of approval, policymakers and national authorities must play their part in facilitating adaptation measures. A Resilience Incentive Mechanism should be set up to encourage utilities to pursue resilience and digital investments. System operators must then cooperate with national authorities to integrate multi-year investment plans with national adaptation strategies to protect and upgrade electricity infrastructure.

At EU level, adaptation must be tackled in partnership with mitigation rather than in silos. The EU climate adaptation funding should also be reorganised to reflect the required risk-preparedness investments and involve all relevant energy actors in defining electricity crisis scenarios and methodologies. Factoring in the effects of the electricity market design on electricity resilience will be key, as market price signals can influence the stability of the overall system by directing dispatch and investment decisions.

Finally, climate adaptation requires all energy sectors to be on board. Stronger coordination and communication between national authorities, transmission, and distribution operators must therefore be enhanced to increase the sector's preparedness for climate change-induced weather.

Going forward, we need to embrace resilience actions rapidly. This is our best chance to ensure a robust and resilient power sector that can support the much-needed electrification of the European economy.

StepUP, boosting buildings decarbonisation through a plug & play façade envelope

The decarbonisation of existing buildings is one of the great challenges that the European Union has set for 2050, and which is included in the 'Renovation Wave' initiative. To work towards the European Union goals, the StepUP project develops affordable solutions and technologies aimed at transforming the energy renovation market and making the decarbonisation of existing buildings a reliable, attractive, and sustainable investment.

To this end, StepUP *"offers a real opportunity to reach net zero emission buildings, by developing non-intrusive, quick and reliable deep renovation intervention tools that reduce installation time on site, minimise the risk of installation errors, and the inconveniences to occupants that deep renovations usually entail,"* underlines the coordinator of the project from Integrated Environmental Solutions Ltd, Amisha Panchal.

Among StepUP deep renovation technologies, a novel plug & play façade has been developed with the capability to integrate windows and the necessary space for the facilities of the building conditioning systems. It consists of an extra layer for existing buildings composed by a thermo-insulating sandwich panel and an external layer available in a wide range of materials.

"The structure is made up of a cold-formed steel frame that supports mineral wool sandwich panels, varying both in height and width to adjust to the different existing façade configurations and facilitate its transport from the factory to the construction site," explains Ester Caldana, Architect at MANNI Group. "*The outer layer of the ventilated façade can respond to a wide range of finishes, facilitating the customization of the intervention and providing an aesthetic improvement to the building*," adds Caldana.

The plug & play façade envelope, currently being demonstrated in a kindergarten in the city of Budapest with poor energy performance, is interoperable and intercompatible with third-party solutions such as solar protection solutions, PV panels or heating and cooling systems, among others. To ensure that the StepUP solution is flexible enough, "*we have developed a protocol defining the technical aspects needed to be followed for the integration of other decarbonisation solutions into the plug & play modules,*" explains David Masip, researcher at Eurecat Technology Centre.

The project also tackles the development of data intelligence solutions to make informed decisions in the design stage and to monitor the performance after implementation. In addition, it also offers financing models for the optimisation of energy, comfort, and cost performance over the life of the building.

In this sense, StepUP "*addresses the European challenge of achieving the decarbonisation of existing buildings by 2050"* in line with the Renovation Wave initiative, an objective "*that will be effective only if cost-effective deep energy renovation technologies and integrated solutions are developed, a key action to reduce energy demand in buildings,*" says Panchal.

StepUP is made up of a consortium of nine partners from seven European countries, including two technology transfer institutions (Eurecat, Unismart), five industrial companies (IES Ltd and IES R&D, Manni Group, ABUD, Energinvest) and two owners and contractors (ACR and Municipality of 18th District of Budapest).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 847053.

Digitalisation of the European Energy System

By Pearse O'Donohue (pictured), Director of Future networks, Directorate-General for Communications Networks, Content and Technology, European Commission

Why is the Commission proposing a plan to digitalise the energy system?
To tackle the EU's dependence on Russian fossil fuels and the ongoing climate crisis, we need to accelerate the twin digital and green transformation of the EU's energy system.

Smart building systems, meters, and electric vehicles, as well as Internet of Things (IoT) devices, provide critical information for monitoring energy consumption, increasing renewable energy integration, and reducing costs. Data services, energy management systems, and applications hold enormous potential, but need further support to become widespread.

To support this transformation, the Commission will undertake a series of actions through legislative initiatives, investments, and coordination with Member States over the coming months and years.

In the medium term, digitalization will facilitate seamless interactions among diverse actors, enabling consumers to benefit from domestic energy sources such as solar panels and community-owned wind turbines. For example, consumers could participate in energy communities and collective self-consumption schemes, taking advantage of their own solar panel generation and benefit from lower cost electricity than buying from the grid.

Similarly, bidirectional electric vehicle charging would provide additional energy resources during peak hours.

In the long-term, digitalization will be a necessity for integrating decentralized forms of renewable energy into the grid, reducing dependence on imported fossil fuels and their price volatility. This integration requires more attention to grid management and more grid flexibility at local level, which can be achieved through activation of consumers and better management of prosumers' energy assets. A seamless access to granular data about the state of the electricity grid and prosumer assets will be critical for delivering energy services but can only be achieved through widespread digital tools and shared data infrastructure.

How is the Commission encouraging investment in the development of smart grids and digital solutions related to energy?
The Commission is promoting investment in the development of smart grids and related digital solutions to ensure the energy sector reaches its full potential. Despite significant progress in digitalisation, with 51% of households and SMEs in the EU equipped with smart electricity meters, more must be done to achieve a fully smart and flexible energy environment.

To reach the goals of the Fit for 55 and REPowerEU initiatives for renewable energy and energy efficiency, the Commission estimates that approximately EUR 584 billion in electricity infrastructure investments will be required from 2020 to 2030, particularly in the distribution grid. Investments in digital solutions, such as grid optimization, can reduce capital expenditures on enhancing existing grid infrastructure and support the deployment of technologies such as electric cars and decentralised renewables. As part of the Digitalisation of Energy Action Plan, the European electricity system operators, both for the high-voltage (transmission) as the medium and low-voltage (distribution) grids, have jointly signed a Declaration of Intent to develop a digital twin of the European electricity grid: The aim is to collaborate on digitalizing the grid, promoting mutual learning, and designing for interoperability.

What measures will the Action Plan implement to address cybersecurity issues?
Digitalisation can bring many benefits to the energy system, including increased efficiency, flexibility, and resilience. However, it also introduces new challenges related to the security of the energy infrastructure and the reliability of the electricity grid.

To address these challenges, the EU has a comprehensive approach that combines specific measures for the energy sector with a broader cybersecurity framework. The recently adopted revised Network and Information Security Directive, known as NIS2, recognizes the energy sector as a critical infrastructure and outlines provisions for national crisis response, risk management, and information exchange.

The Commission will work with the NIS Cooperation Group, ENISA, and other stakeholders to identify ICT services and products that may be subject to coordinated risk assessments. Particular attention will be given to risks in the renewable energy and grid supply chain, including offshore wind.

What is the Commission proposing to address the energy consumption of the information and communication technology (ICT) sector?

The ICT sector is projected to consume 13% of the world's electricity by 2030, contributing 3-5% of global carbon emissions. To reduce energy demand and reach climate neutrality, the EU is taking steps to make ICT products more energy efficient and environmentally friendly. The Commission is extending the Eco-design for Sustainable Products Regulation to cover new ICT products and developing an energy label for computers, incentivizing manufacturers to create products that are energy efficient, reparable, reusable, and recyclable.

Data centres, seen as critical infrastructure, accounted for 2.7% of electricity demand in 2018 and will reach 3.2 % by 2030 if development continues along the current trajectory. The Commission is acting by introducing energy consumption monitoring and reporting requirements in the Energy Efficiency Directive, developing an environmental labelling scheme for data centres, exploring separate reporting lines for indirect greenhouse gas emissions from cloud computing and data centre services, and improving the operating conditions of servers and data storage products through revised Eco-design rules.

What funding options will be provided to achieve the objectives outlined in the plan?

The EU has several funding instruments to accelerate the twin transition to a smart and sustainable energy system.

The Horizon Europe 2021-2027 programme will aid in enhancing interoperability, involving consumers in the new energy market, and piloting energy data spaces as well as support for the digital twin of the electricity grid. The Digital Europe Programme will play a crucial role in the deployment of a common European energy data space and support the European Cybersecurity Competence Center and Network of National Coordination Centers. Connecting Europe Facility grants can be used for cross-border smart grid projects of common interest (PCIs). National Recovery and Resilience Plans provide a means for Member States to channel funding into the digitalization of the energy sector.

In conclusion, the digitalisation of the European energy system is a crucial step in the transition to a more sustainable and secure energy system. The EU's action plan on the digitalisation of the energy sector is an important next step in this process and will help to drive the integration of digital technologies into the energy sector. This will support the growth of renewable energy production, increase the efficiency of the energy system, and promote the development of innovative solutions that can help to reduce the costs of energy production and consumption.

Decarbonisation requires new and creative ways of re-using energy and funding of decarbonisation solutions

Revolutionary green technologies like E.ON ectogrid™ demonstrate that reducing emissions is much more than switching to renewable energy generation.

By Dr. Patrick Ester, Value Pool Public Funding, E.ON Energy Infrastructure Solutions (EIS).

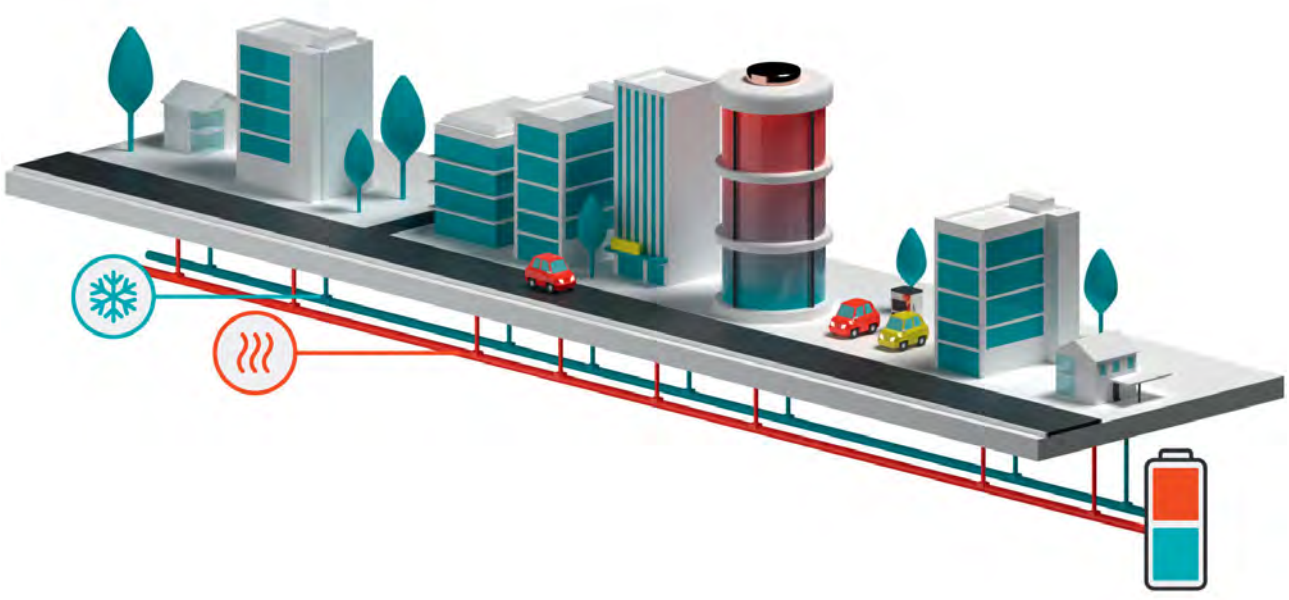
In the long-term, Greenhouse gas emissions cannot be eliminated only changing the way energy is generated. Energy efficiency and other measures of reducing consumption and recovering energy should also be considered as levers for reducing emissions.

That's why E.ON has been much more than just an electricity and gas supplier for many years. As one of the largest operators of energy networks and energy infrastructure in Europe and as a provider of innovative solutions, we now provide more than 50 million customers in 16 countries with smart solutions. By doing this we are decisively driving forward the energy transition in Europe and are committed to sustainability and climate protection.

The focus of all our activities is to ensure that the Europe-wide climate goal formulated in the Paris Climate Agreement does not remain simple "lip service" and to make the biggest possible contribution to the EU for achieving this. Our entire portfolio of solutions is geared towards supporting private customers as well as companies and cities in their decarbonisation efforts.

When you consider that process heat alone accounts for 40% of energy consumption in industry and commerce in Germany, and that around half of the heat used in industry is lost unused as waste heat, it becomes abundantly clear that above all, the energy transition is a heat transition. Therefore, the focus should also lie on the sensible reuse of unused heat. This does not just apply to industries but also to cities, which are responsible for 40% of energy consumption.

The example shows that it is not enough to set targets for individual sectors, but to work out much more creative methods on CO_2 avoidance. Unfortunately, there is no such thing as a single "silver bullet" that will solve all our problems. Rather, it is necessary to analyze all (production) processes. First, it is important to use energy generation methods that



are as carbon-free as possible – electricity first. In a second step it must be checked whether system-related energy, mostly in the form of heat, can be recovered or used in some other way. Sustainability, costs, security of supply and efficiency are all high on the list of requirements and want to be met.

An example of new coupled solutions in this segment is the use of waste heat from data centers for supplying local district heating networks. In the past, the temperature levels were too different and using the waste heat was inefficient. But with the development of our ectogrid™ technology, there now exists a new way of doing that. E.ON ectogrid™ is a complete energy system for heating and cooling that enables the sharing, balancing and storage of energy for entire neighborhoods and cities and can thus help achieve zero emissions. Due to the complexity, new forms of cooperation must be developed first by introducing new actors. For example, municipal heating planning, which introduces further framework conditions into the process, plays a decisive role.

The European Commission and national legislators are pushing the energy transformation with legislative packages and funding programs. We expressly welcome the commitment of the European Commission and the will to shape these transformation processes. At first glance, the road is a rocky one, but it is nevertheless necessary.

Municipalities and industry are closely monitoring the various funding opportunities (like horizon framework, Innovation Fund, Life, CEF,...) offered by the EU. However, it has been shown again and again that these calls are extremely oversubscribed, i.e. the probability of funding is low and at the same time there is a lot of effort involved in preparing application documents. In most cases, this acts as a deterrent to participating in the calls. And it is not only CAPEX funding is important, but OPEX funding as well. Recently, CCfDs (Carbon Contracts for Difference) have been increasingly discussed.

Recently, CCfDs offer the possibility of taking out risk for the operator by means of a fixed contract price. At second glance, however, it is unclear to what extent this funding instrument contributes to planning security. Because it is not possible to create a business case in which there is no certainty about possible repayments. In any case, the funding instruments for both CAPEX and OPEX funding should be further developed.

At the beginning of every transformation process, it is important to demonstrate that a new technology or system can be implemented. The promotion of large lighthouse projects is suitable for this. To create a broad impact on the masses, however, many medium-sized and smaller projects must now also be funded to benefit from scaling. The aim and framework should always be focused on the climate impact. It is necessary that service providers and contractors are also included in the general conditions.

Industries and cities, with their high emissions, face enormous challenges on the road to climate neutrality. We are convinced that the transformation can only succeed with intelligent solutions that are at the same time decentralised, future-proof, and above all, efficient. In the E.ON Energy Infrastructure Solutions unit, we're working to provide industries and cities with tailored energy solutions that meet these requirements – whether it's heating, cooling, power generation, or energy efficiency. We are convinced that strong partnerships can bring ecology and economy together and thus create unimagined joint opportunities – benefit from unconventional ideas, amazing synergies, and lower energy costs.

Contact details

Dr. Patrick Ester has been working on research and innovation topics in the energy industry for more than 15 years. Decarbonisation is the order of the day and the basis for the transition to the solar age. That's why he is very happy to be able to promote the energy and heat transition within E.ON as a change maker. Today Patrick is responsible for the Value Pool Public Funding within E.ON Energy Infrastructure Solutions (EIS).

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More about E.ON Energy Infrastructure Solutions:
http://www.eon.com/eis

Time to take off – eFuels as a backbone of climate-friendly air transport

By Ralf Diemer (pictured), Managing Director, eFuel Alliance

Engines are becoming more efficient, aircraft more aerodynamic, materials lighter – circularity and savings are the be-all and end-all for lasting climate protection. So far, the aviation sector is largely unregulated, the use of paraffin has no alternative. However, the use of sustainable aviation fuels (SAF) could already significantly protect the climate today.

500 airports, almost 30,000 aircraft, 370 million passengers on the move, billions of parcels transported – and the trend is rising. The European aviation sector is a fundamental pillar of our economic power and a backbone for the transport sector. Aviation is becoming increasingly important, but it must also become increasingly clean. In mid-2021, the European Commission presented ReFuelEU Aviation, a proposal dealing with the defossilisation of aviation. The legislative process is already advanced: The proposal is currently being discussed by the Commission, Council and Parliament in trilogue.

The directive requires member states to implement mandatory blending quotas of Sustainable Aviation Fuels (SAF). SAF combine all types of sustainable, renewable fuels – i.e. biofuels as well as synthetic fuels (eFuels) – and these can be easily used thanks to their "drop-in" capability. This is direct climate protection that remains affordable for the industry as well as for private individuals due to the increasing blending quotas. Today's aircraft turbe technology and certification already allow very high blending rates – note that this requires no technological adaptation or changes in infrastructure, aircraft or turbines. But its use is in its initial stages and planned quotas, which are supposed to provide investment incentives, are not ambitious enough.

The Commission plans to have such quotas come into force from 2025 and start at 2%. Accompanying the ramp-up, the quotas are to rise to 5% in 2030, 32% in 2040 and 63% in 2050. Corresponding sub-quotas for synthetic fuels, i.e. eFuels, will start at 0.7% in 2030 and climb to 28% by 2050. Various European member states, including Germany, have already introduced such quotas. Different projects show that the use of SAF is attractive for passengers as well as for airlines.

How quickly the development of an SAF industry and thus the ramp-up of sustainable fuels such as eFuels will be rolled out depends strongly on the political will. Because the industry is waiting in the wings. A prominent example is the collaboration between Neste and Coldplay. The fuel manufacturer is supplying the band with SAF in order to reduce the CO_2 emissions of their world tour by 50%. Furthermore, Nordic Electrofuels

has already turned its ambitions into reality and put a first plant into operation in Norway, or the Swiss start-up Synhelion, which will supply Swiss International Air Lines. So production is already taking place on a small scale, but we are still a long way from industrial production.

The introduction of the proposed quotas is therefore absolutely necessary for the market ramp-up of climate-neutral eFuels, but they are too low. Firstly, because these quotas have a significant impact on the investment and planning security of corresponding companies and secondly, because the level of the quotas also reflects climate protection ambitions.

After all, eFuels are 100% climate-neutral and thus climate-friendly, unlike conventional jet fuel. By combining renewable energy and CO_2 captured either from industrial sources or directly from the air, a reliable closed-loop system is thus established that does not emit any additional CO_2. Unavoidable CO_2 emissions can be skimmed off and recycled in a climate-protecting way. eFuels thus additionally support other sectors as a bridging technology in achieving their climate goals.

If aviation should function in a completely climate-neutral way, SAF must be used across the board by 2050. But there is a long way to go until then and the levers to be moved are numerous. For this reason, it is not only the setting of corresponding quotas that is relevant, but also and especially the massive global expansion of renewable energies and, in the next step, the hydrogen economy. A broad approach here not only promotes the establishment of eFuels, but also acts as an accelerator of climate protection across all sectors. The positive side effects ultimately also drive the defossilisation of other transport sectors, especially road transport. If we take climate protection seriously, then every climate-friendly technology must find its place wherever possible.

Decarbonising aviation in the EU The potential of using sustainable aviation fuels

By Dietmar Bloemen, Sustainable Aviation Programme Manager, EASA

In the past few years, a multitude of 'net zero CO_2 emissions' targets for aviation have been set by individual companies, industry associations and governments in support of emission reductions that align with the Paris Agreement goal of capping global warming at 1.5° Celsius. However, in order to achieve this goal more efforts will be needed. To illustrate: CO_2 emissions of all flights departing from the EU27+EFTA airports reached 147 million tonnes in 2019, which was 34% more than in 2005.

This increase is due to traffic growth outpacing fuel efficiency improvements and reductions of emissions from other sectors. In the near-term, the best and most promising contribution from aviation is undoubtedly the widespread adoption of Sustainable Aviation Fuels (SAF), alongside further operational improvements and market-based measures. Novel technologies such as hydrogen-powered and electric aircraft, will bring a further step change – but these developments will take time.

What are Sustainable Aviation Fuels?
A Sustainable Aviation Fuel (SAF) is a sustainable, non-conventional, alternative to fossil-based jet fuel. SAF may include biofuels as well as synthetic fuels, such as power-to-liquid fuels, and are further characterized by their type of feedstock and production processes applied. In the EU, SAF are defined in the Renewable Energy Directive and the RefuelEU Aviation regulatory proposal.

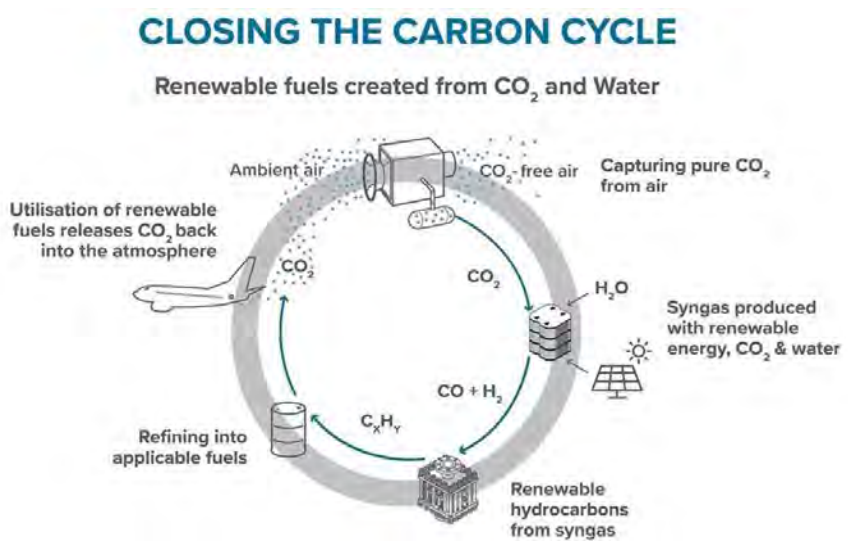
As the emissions from the combustion of SAF are comparable to fossil-based jet fuels, except for marginal efficiency gains, the majority of the reductions in greenhouse gas emissions originate from the production process. In order to assess the overall climate benefit from using SAF, a Life Cycle Analysis (LCA), as part of the sustainability certification process, is performed to account for all the stages in the life cycle of aviation fuels.

Depending on the type of feedstock and the innovative production process applied, emission reductions up to 100% can be achieved (e.g. power-to-liquid fuels based on renewable electricity and CO_2 captured from the air).

In addition, SAF feedstock and production process typically result in very low levels of sulphur and aromatic content and this provides further benefits on both air quality around airports as well as climate change through the reduction in the formation of contrail-cirrus clouds which would otherwise act as a light blanket trapping heat emitted from the Earth's surface into the atmosphere.

In order to be safely used in

Figure 1: Carbon cycle in producing power-to-liquid (PtL) SAF (Source: European Aviation Environmental Report 2022)



commercial aircraft, SAF have to go through an exhaustive approval process to fulfil strict safety related certification criteria and prove that their physical and chemical characteristics are almost identical to fossil-based jet fuel and can therefore be safely blended together. As such, SAF offer a great potential to decarbonize aviation as it does not require any changes to existing aircraft technology and airport infrastructure. However, due to safety reasons, the European Union Aviation Safety Agency (EASA) currently does not yet allow commercial aircraft operations on SAF blends going beyond 50%.

Aircraft and engine manufacturers have already initiated rigorous test procedures leading up to safe operations on certified SAF blends up to 100% allowing to unleash the full potential of SAF in the years to come.

RefuelEU and the need to boost SAF production

The biggest challenge for widespread adoption lies elsewhere: SAF are available today only at limited volumes and at a higher cost than conventional fuels. Help here will come from the RefuelEU Aviation legislative proposal which can be seen as an efficient instrument for swift implementation and scale-up of SAF usage by setting EU-level harmonised SAF targets.

The goal is a gradual ramp-up of SAF availability at EU Airports starting at 2% SAF blending in 2025, 5% in 2030 and rising to 63% by 2050. Under the RefuelEU Aviation proposal EASA's role is to monitor, analyse and report on the supply and use of SAF in the EU.

The Refuel EU Aviation SAF targets would reduce aviation emissions by around two thirds by 2050. To achieve these targets, 2.3 million tonnes of SAF would be required by 2030. Approximately 14.8 million tonnes of SAF would be required by 2040, and 28.6 million tonnes by 2050. However, today's reality is that, from a production capacity and demand point of view, the SAF industry is still at an early stage of development with an estimated EU supply of less than 0.05% of total jet fuel demand in 2020.

It is estimated that production capacity needs to increase over time with 104 more production plants in the EU by 2050, considering importing of SAF from outside the EU may not be straightforward.

Additional measures to make SAF more widespread

To achieve these ambitions, EU regulations need to be supported by additional flanking measures such as collaboration initiatives across the entire value chain which the European Commission has initiated in 2022 under the name of Renewable and Low-Carbon Fuels Value Chain Industrial Alliance.

EASA is supporting this new Alliance through a workstream aiming to reinforce the EU capacity to certify new SAF types by developing more efficient approval processes and facilitating new EU SAF producers' initial qualification testing leading up to full certification at aircraft level. As regards the cost aspects: the current SAF production costs can range from 1.5 to 6 times the price of fossil-based jet fuel.

The long-term trend is expected to be a reduction in SAF production costs enabled by economies of scale and technological advancements. Additional economic incentives from market-based measures (e.g. EU ETS) will also help in reducing the price gap relative to fossil-based jet fuels.

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European Union Aviation Safety Agency

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Project TradeRES

New Market Designs for a near 100% Renewable European Power System

By Ana Estanqueiro[1], António Couto[1], Dawei Qiu[2], Goran Strbac[2], Evelyn Sperber[3], Gabriel dos Santos[4], Johannes Kochems[3] Jos Sijm[5], Nikos Chrysanthopoulos[2], Zita Vale[4]

The electrical power sector landscape was shaped in recent years by the European Union's energy policy and focus on the transition to a decarbonised energy system. Renewable generation has grown significantly in the past decades, and this steady growth will continue in the coming years. Large-scale fossil-fuelled power plants are being phased-out, while variable renewable energy systems (vRES), especially solar and wind technologies, are continuously increasing their shares in the supply mix. In addition, flexible storage resources (e.g. electric vehicles, batteries or heat pumps) are being deployed and an increasing number of end users are changing from passive consumers into prosumers.

At present, it is still unclear if current electricity markets design, which is based largely on marginal costs pricing, will be able to evolve into a form adequate to embed the impact of the rising penetrations of vRES. However, it is already clear that the current design does not favour their fair participation unconditionally, due to the inherent fluctuation nature of vRES generation. The need of R&D assisting to adapt the current electricity market rules to a new trading and power system's paradigm is widely recognized these days.

That was the context in which project TradeRES – Tools For The Design And Modelling Of New Markets And Negotiation Mechanisms For A ~100% Renewable European Power System (H2020 contract 864276) was conceived, having as goals to: i) Identify actual barriers and deficiencies of current energy market and pricing structures; ii) Calculate cost, value, and price structure of electricity in a ~100% vRES-dominated electricity system for 2030 and beyond; iii) Conceive, design and model electricity markets that deal with novel flexibility products; iv) Develop optimization and agent-based market models beyond the state-of-the-art.

To achieve these ambitious goals, existing agent-based market models are being further improved with new features and coupling worksflows, and also new models are being developed, that are applied to five different case studies ranging from local communities and markets (Case Study A) to the European market (Case Study E), passing through the national and regional scales (B – The Netherlands, C- Germany and D-Iberia/MIBEL), as depicted in Fig. 1.

The TradeRES project was conceived with an iterative methodology (Fig. 2), in which the newly developed designs and products are tested by market stakeholders. The second iteration of the studies will apply a new improved version of the market functionalities reflecting the inputs and suggestions received from the stakeholders.

TradeRES' research questions, scenarios and Market Performance Indicators for ~100% RES Power Systems

A deep and detailed exercise was conducted to clearly identify the relevant research questions (RQs) to be addressed by the project, cluster them within classes, as well as to associate them to the capabilities of different models and markets characteristics. Seven different classes of RQs were identified: 1) Improvement of energy-only (EOM) short-term markets; 2) system design and adequacy; 3) ancillary services in ~100% power systems; 4) investment incentives for vRES and 5) for secure capacities (EOM or capacity mechanisms); 6) Incentivizing distributed flexibility and local markets and 7) Incentivizing demand response and sector coupling.

A set of scenarios were developed

Figure 1

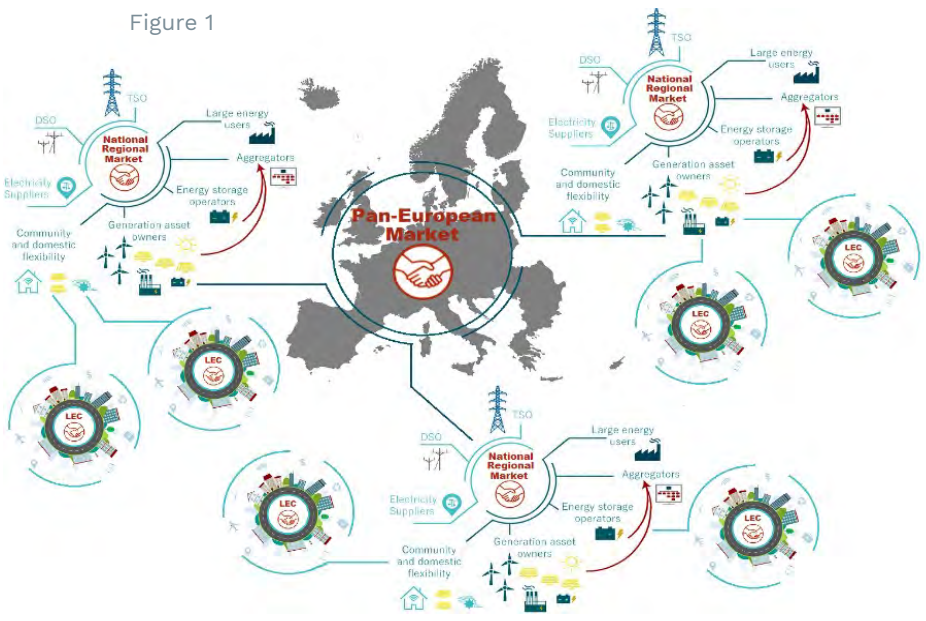
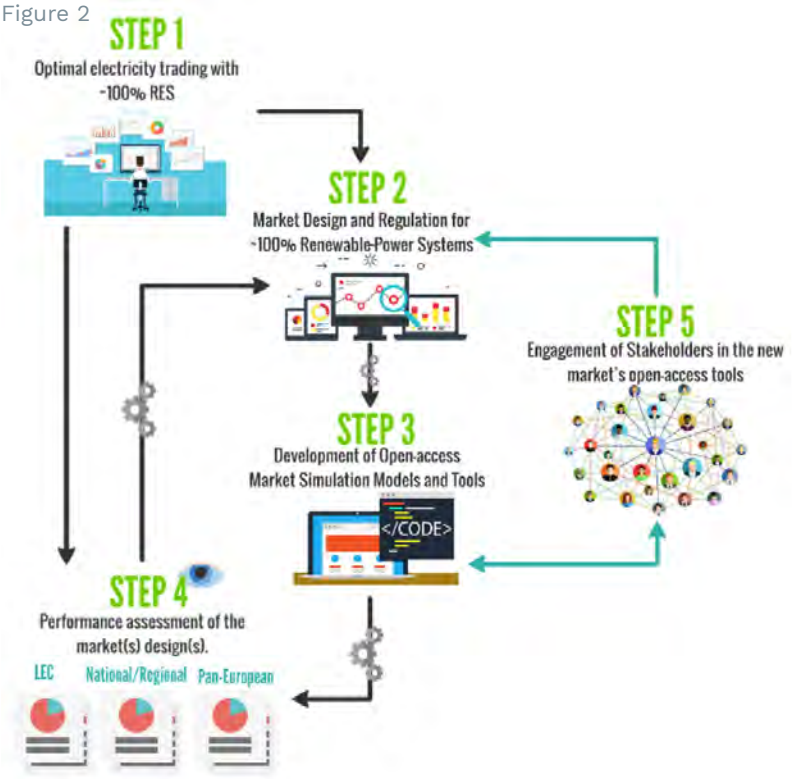


Figure 2



based on optimization models and those were recently simulated for national and regional markets: These include, e.g. scenario S0 to capture key milestones of the energy transition process which is planned to occur by the year 2030. The expected transition until 2050 (when climate-neutrality is to be reached) is addressed through S1-S4 TradeRES Scenarios. These are identified as the "Conservative" (S1), "Flexible" (S2), "Variable" (S3) and the "Radical" (S4) scenarios. The timeline in Fig. 3 positions the scenarios to the key milestone years and also indicates the Starting Point Scenario (SPS) that refers to a historic recent year with stable market and power system performance (i.e., 2019, recently simulated) [see Deliverable 5.3].

Figure 3

The Local, National and Regional European Markets

Although it is not within TradeRES work programme to address the actual volatility of electricity markets, mainly induced by external factors, the recent events further enhanced the need to electricity markets and carefully identify their vulnerabilities, to design new features that are more robust and present a lower level of risk for all the players involved. In that context, it is of particular relevance to study the future evolution of existing electricity markets in Europe, what TradeRES recently successfully concluded.

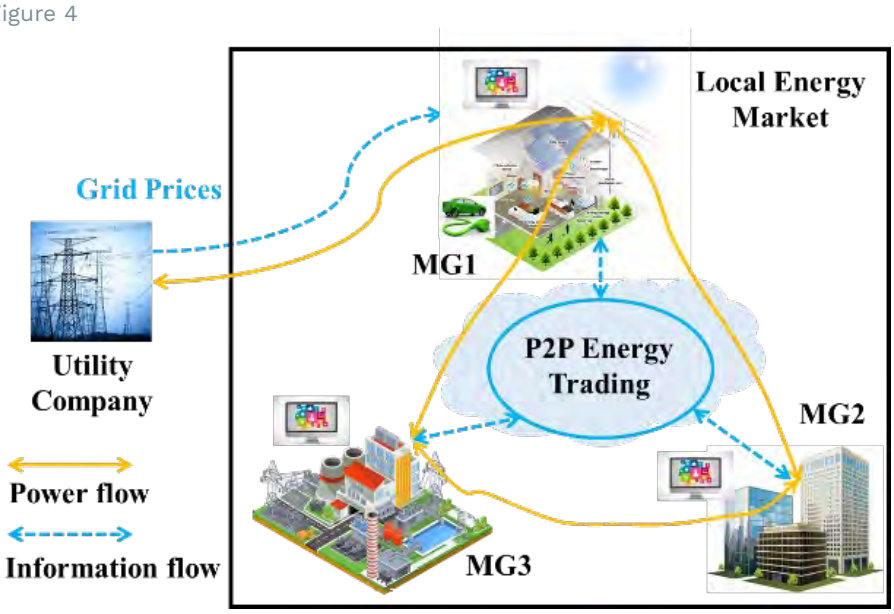
The National and Regional European Markets accomplished the set of simulations by addressing the following aspects: Case Study B – the behaviour of the Dutch electricity market using the soft-linked market models AMIRIS-EMLabpy aiming to analyse both if an energy-only market will be sufficient to achieve the Netherlands' vRES target for 2050 and to analyse if such a system can ensure security of supply. Case study C addressed the German day-ahead market using the agent-based model AMIRIS to analyse the need and possible design of remuneration schemes for vRES; Case study D addressed the Iberian market (MIBEL) with the agent-based models MASCEM and RESTrade to analyse new market features able to mitigate the impact of vRES variability and uncertainty in the market revenues of those power plants.

Given the parameterisation of the SPS (including a moderate CO_2 and commodity price level), for the remuneration schemes examined (an EOM without support, a fixed market premium, a variable market premium, a two-sided Contracts for Differences scheme and a capacity premium), not much difference is observed in terms of most market performance indicators (MPIs) studied. This holds for a system with a moderate RES share (34%) and relatively low average price levels compared to the current high price situation. Given such a price levels it was also found that renewables would not be able to recover their full costs on a pure market basis. The parameterizations assumed in the Iberian case study (D) revealed different market outcomes for Portugal and Spain. E.g., when levelized remuneration supports (the same as described for the German case study) were applied to both countries for the SPS scenario, in Portugal only the two-way contract for differences (CfDs) scheme does not enable players to obtain remunerations above the variable premium, used as reference, whereas in Spain, in what concerns wind energy, none of the support schemes allowed wind investors recovering their (annualised) investment costs.

Economic Benefits of P2P Energy Trading Paradigm

Based on the trading paradigm shown in Fig. 4, within TradeRES a peer-to-peer (P2P) trading platform is coordinating energy trading (quantities and prices) among three microgrids (MGs), independent of the

Figure 4



upstream utility company. MGs in the P2P trading platform can buy/sell their energy deficiency/surplus with each other at local prices rather than trading with the utility companies at the offered grid prices, e.g., Time-of-Use (ToU) tariff and Feed-in Tariff (FiT). More specifically, a MG with an energy deficit can take advantage of other MGs with an energy surplus by purchasing their excess at a lower local price in comparison to the grid's ToU tariff. On the other hand, a MG with excess energy can make more revenue compared to the unattractive grid FiT by participating in P2P trading. In this context, MGs can first share their energy demand and generation internally within an energy cooperation concept and settle the remaining energy deficit or surplus with the utility company. It is expected that the local trading prices obtained are within the range of grid prices (i.e., FiT and ToU), so that the buyers and sellers within the MGs can achieve more trading deals and cost-effective performance locally. Overall, the benefit of P2P energy trading lies in balancing local demand-supply, utilizing local renewables, reducing energy costs and managing local network congestions. The TradeRES project will also evaluate the above P2P energy trading paradigm and assess the role and value of the Local Energy Markets (LEM) in supporting cost effective transition to zero carbon electricity system.

Final notes

All the first simulations applied to national and regional markets are preliminary and it is too soon to extract final conclusions or recommendations for suitable market designs. However, the MPIs obtained so far for SPS scenario (2019), point out energy-only markets seem to be insufficient to give enough incentives to promote investment in a high volume of renewables. For the German case study, this holds for all kinds of RES that showed market-based cost recovery rates below 100% (slightly above 70% for PV, roughly 50% for onshore wind and 34% for offshore wind), which are also affected by the relatively low price levels of the considered scenario. An exception exists, as PV systems in the Iberian electricity market (MIBEL) were found to be profitable on an EOM basis.

The 2019 simulations of MIBEL and the Portuguese and Spanish ancillary services and imbalance settlements enabled to calibrate the MASCEM and RESTrade models to obtain close-to real-world results. For the second iteration of these markets, S1-S4 scenarios will be addressed, assessing the impact of temporal and sectoral flexibilities and the performance of new market design bundles for RES-dominated scenarios. In what concerns ancillary services markets, the Portuguese and Spanish control zones have different rules for vRES market players. In future scenarios, the participation of vRES and demand players in these markets will be addressed for both countries.

Finally, the studies conducted enable to observe a P2P energy trading paradigm contributing to the efficient management of energy supply and demand by promoting direct energy exchange within a local energy market, which would provide significant economic benefits, compared to a conventional retail market.

Readers may find more information about TradeRES project at the link https://traderes.eu/ including the large majority of the deliverables, of public access.

This work has received funding from the EU Horizon 2020 research and innovation program under TradeRES project (grant agreement No 864276).

The negative effects of climate change have been broadly demonstrated and renewable, carbon-free energy has proved to be one of the most important keys – if not the most – to achieve the transition that will halt human-induced global warming. The effort is well worth it, as there are a number of generation technologies that have been developed in the last decades capable of accomplishing the environmental targets established by governments and other global institutions to fight against climate change. Nevertheless, analysing the evolution of the implementation of these technologies unveils that the time factor is critical and that a slow-paced change will not meet such targets, compromising the well-being of future generations.

COREWIND is the European project that began in this context – back in 2019 – to extend the applicability, reduce the costs and bring closer the commissioning of utility-scale plants of one on these technologies: floating offshore wind. Its implementation unlocks vast areas where wind energy could be generated around the globe with low impact on both human activities and the environment. Finishing next year, the project is in an advanced state already with some results leading to its main goal: reducing the LCOE (Levelised Cost Of Energy) of the technology, while maintaining a low environmental impact.

An example of the innovations conducted by the consortium are the shared anchors and shared mooring lines studies. As opposed to a conventional wind farm design where each turbine is moored independently, these studies aim at sharing certain components of adjacent units to reduce the cost of the system. The technical feasibility of a farm with shared anchors has been proved, but with limited cost benefit as the anchors cost is reduced but the mooring lines cost increases. However, the analysis of shared mooring lines lead to large costs reduction.

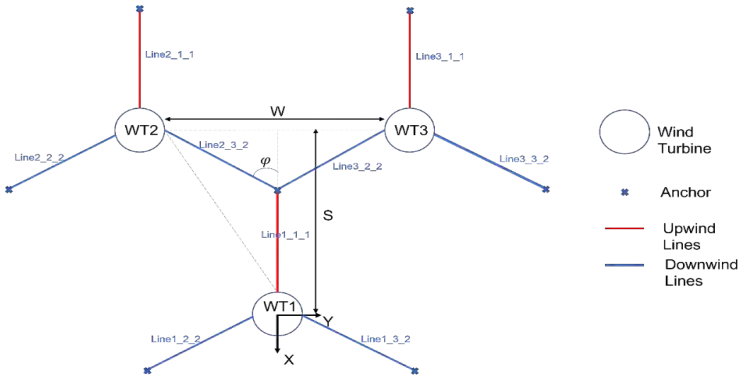


Figure: Shared anchors study

Another potential innovation to further reduce the LCOE of the floating wind farms have been studied by optimising their layout. Instead of following a regular distribution of the wind turbines in the site, a PSO (Particle Swarm Optimisation) has been applied to position the wind farm assets (offshore substations included), achieving reductions up to a 5% of the LCOE compared to the base cases with regular distributions.

The reliability of the results is deemed critical, therefore an accurate model has been implemented; among others, power losses are calculated by means of power flows following IEC standards, the site bathymetry is considered to modify the mooring system costs and restrictions such as minimum distance to shore or avoiding mooring line crossings are ensured.

The different improvements developed by the partners have not been limited to ideas and calculations. Instead, a validation campaign has been conducted to verify the materials behaviour in real conditions, as well as the integrated behaviour of two substructure concepts – ActiveFloat and WindCrete – together with their mooring lines and dynamic cables in a wave basin.

These and additional studies and improvements are being developed in COREWIND, which will be quantified together in the first half of next year to measure their impact. In all, the project is advancing successfully, delivering high-quality insights to the sector and providing a sustained boost required by the technology in order to achieve the ambitious environmental targets we need to stop global warming.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 815083.

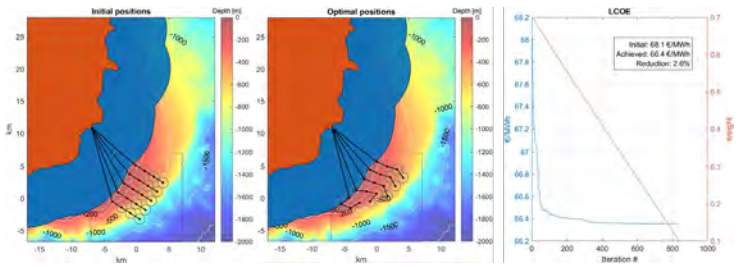


Figure: Layout optimization

Where the Critical Raw Material Act should critically act

By Platform for electromobility

The vital transition away from fossil fuels and towards cleaner technologies such as electric transportations –cars, trucks, buses, trains, public transportations etc. – will drive the demand for raw materials such as lithium, nickel, copper, and cobalt in varying amounts depending on the technologies and applications.

Whilst some Critical Raw Materials (CRM) are available on the EU territory, Europe remains largely dependent on third countries for mining, processing, refining and recycling, a dependency amplified by current geopolitical and supply chain tensions causing volatility and raising prices and uncertainties on global supply.

We therefore strongly welcome the principle of Commission's CRM Act and will shortly publish a detailed assessment for the electromobility ecosystem view point.

Three identified flaws for Europe on CRMs

In light of the urgent transition to e-mobility and the need to ramp up a domestic Electric Vehicle (EV) value chain in Europe, the **EU is first and foremost lacking domestic capacity that goes beyond battery manufacturing**, i.e extracting but also and critically **refining and processing** capacity, along with **recycling**. Such processes are still almost entirely done in resource-rich, more experienced and competitive third countries, thus jeopardizing both the autonomy of Europe in CRM and the respect of the upmost environmental standards

It is crucial for Europe to build processing and refining capacity in Europe for battery materials using existing domestic sources of valuable materials and to increase recycling capability and competitiveness to reduce the EU's dependence on primary raw materials.

The second flaw is the **excessive hurdles to the permitting**. In particular, the plurality of mining codes in Europe creates different levels of ambition and incoherence across Member States which in some cases may threaten safeguards to social or environmental protection. Permitting processes become too lengthy when multiple permits are required for both renewable energy production and sustainable mineral extraction projects. Member States lack expert capacity to ensure the efficient, robust and timely evaluation of Environmental Impact Assessments and Area Assessments.

Thirdly, there are limited amounts of sustainably sourced, highest quality materials, notably due to incomplete, limited mapping of geological and remining potentials. There are also barriers to the reuse and repurposing of EV parts, which could extend the lifecycle of CRMs before recycling, thereby reducing final CRM demand.

Consequently, the Platform for electromobility highlight the need for the EU's Critical Raw Materials Act (the Act) to consider to the following 10 areas:

1. Strategic steering

We welcome the objective of establishing **a single European strategy on raw materials** that defines expected needs, challenges, priorities, and key lines of actions with specific objectives of reducing the need of primary CRMs, with efficient repurposing, reuse and recycle while maintaining high environmental and social standards and increasing their supply security.

The objective of a coherent, EU-wide

strategical Act should be to avoid many small initiatives triggering competition within and between Member States and create an integrated and coherent development strategy in order to allocate resources more efficiently.

2. Financial and political support for recycling

Economic actors meeting the highest existing environmental standards (e.g. mine tailings) and social standards (e.g. community consultation) should be eligible to financial and political support. For EU-sourced materials, the Act would then work in relation with the existing package of environmental policies which control impacts from its domestic mining and refining operations and the high EU social standards.

3. Incentivize sustainable and secondary sourcing

Sourcing should be both sustainable and sufficient. The legislation should focus on ensuring availability of supply which respects human rights and environmental standards regardless of the country of origin.

4. Sustainable mining in Europe

While repurposing should always be the preferred option to uphold resources, and while mining is a topic to handle with care and consideration for local and social contexts, it is nevertheless important to consider the full value chain.

5. Considerations for international sourcing

When solutions for European sourcing (from repurposing, recycling, to remining and mining) are not sufficient, various options for sourcing CRM internationally should be considered.

6. The risks of stockpiling

We call for a very cautious assessment of the need for stockpiling mechanisms as they may have unintended negative impacts on the markets and nascent European industries. We do not favor direct market intervention in the form of strategic reserve buying or policies designed around redistribution schemes.
Policies building strategic reserves can artificially inflate prices and negatively impact the development of European
producers of value-added goods dependent on these critical raw materials.

7. Environmental standards

The Act should not yield way for weakening any environmental regulation but rather offer the opportunity to safeguard key ones as a condition

8. Set appropriate recycling and second-hand market rules

The EU should reduce its dependency on imports of material of strategic importance for production. Sourcing should take place within the EU and should include **sourcing of secondary raw materials from waste**. As all recycling activities are not financially viable today due to the low cost of some primary resources and unavailability of recyclable material, **support for the development of recycling capacities** is crucial to enhance the circularity and sustainability of CRMs sourcing.

9. Modernize permitting and licensing

As highlighted in the introduction, irrelevant permitting procedures represent a key hurdle. **Procedures should be modernized, made more robust and transparent and strongly simplified** without undermining existing environmental laws (e.g. Industrial Emissions Directive, Water Framework, Habitats Directives) and in compliance with Environmental, social, and corporate governance criteria. Support for permitting authorities with expert capacity at national level is also necessary and the digitalization of the permitting process would ensure transparency and full engagement from project developers to local communities.

10. Ensure consistency, certainty and synergy across legislations

It would be helpful to consider the potential links and synergies between the CRM act and other legislations already in place (e.g. environmental and human rights regulations); and to ensure consistency across different pieces of legislation to meet the needs of the CRM demand sector.

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Energy islands for sustainable and resilient source of energy

By Dr Trayana TANKOVA, Faculty of Civil Engineering and Geosciences (CEG), Delft University of Technology, Netherlands

Climate change and environmental degradation are an existential threat to Europe and the world. The European Commission's, European Green Deal, which was launched in 2019, aims to make Europe climate-neutral by 2050. As part of this plan, the Commission has identified offshore wind energy as a key priority for reducing carbon emissions and achieving this goal.

Besides the strategic decisions of the EU and UN to proceed for a Sustainable Future in the built environment, sustainable energy technology has seen in the last decades a very fast- growing much beyond the early-stage concepts of Ocean Thermal Energy.

In addition, innovative technologies have been recently developed to store the produced sustainable energy locally and then, transfer it whilst smart systems to improve network efficiency have been investigated and continuously updated.

Nowadays, there are more than 350,000 wind turbines spinning around the globe with about 10% of them combined to alternative sustainable energy systems (photovoltaics, wave and tidal energy systems etc.). Due to continuous technological advances, the concept of floating offshore Energy Islands (i.e. offshore wind power combined to other renewable energy sources and energy storage) seems to have recently become far more cost-effective and much more widespread than expected.

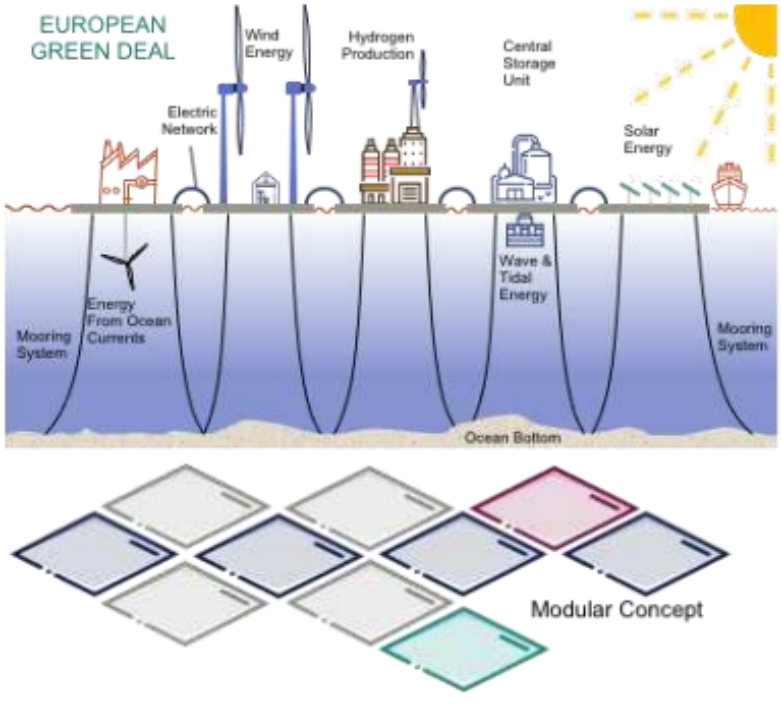
Energy Islands are artificial offshore platforms aiming to generate large amounts of renewable energy, typically through offshore wind farms, and use it to power surrounding regions. These projects have gained traction in Europe as a means of reducing carbon emissions and meeting climate targets. Energy Islands are foreseen to become during the next decade the top source of Sustainable Energy generating capacity in Europe, in the USA and Canada, and the 2nd largest in China.

Currently, there are several energy island projects in development across Europe, including the North Sea Wind Power Hub, which aims to connect large-scale offshore wind farms in the North Sea to surrounding countries through a shared grid, and the proposed Danish Energy Island in the North Sea, which would serve as a hub for offshore wind power production and transmission.

However, less than 10% of the world's electricity was harvested by wind energy infrastructure last year that obviously is not sufficient to trigger a shift of the global economy away from the climate-warming fossil fuels that still supply most of the world's energy.

Based on this observation, and taking into account the current initiatives, a multidisciplinary collaborative research network was launched in 2021 to explore options and potential solutions, the COST Action: Modular Energy Islands for Sustainability and Resilience (MODENERLANDS). The network has about 170 members spread in 42 countries.

Figure 1: On the concept of MODENERLANDS (MODular ENERgy isLANDS)



MODENERLANDS revisits safe, smart, modular, cost-effective and socially valuable high-performance sustainable Energy Islands for consideration in the plans, design and development of the future sustainable energy infrastructure. This concept works with modularised construction of offshore floating platforms, aiming at easily extending their size and capacity according to future energy needs.

The Modular Energy Island will act as a platform to maximise collection and conversion of the renewable energy sources and efficiently transfer them to the network, exploring cutting-edge Green Hydrogen related technologies for efficient energy storage and transportation.

This collaborative team of researchers will develop a European-based scientific and technological network with strong multi-/interdisciplinary features that will work on the exploitation of the research outcomes related to Modular Sustainable Energy Islands by integrating all related stakeholders, thereby intensifying the links among scientific and research groups and Sustainable Energy industry.

MODENERLANDS promotes synergies that offer breakthrough scientific developments leading to new concepts and R&D outcome. The network will contribute to strength the European research and innovation capacities on Sustainable Energy Applications along the European Green Deal lines.

Finally, in the context of the current energy crisis, the development of energy islands is seen as a key solution for meeting growing demand for energy while reducing carbon emissions. By investing in large-scale offshore wind farms and associated infrastructure, Europe can develop a reliable, sustainable source of energy that will help to address both the short-term and long-term challenges of the energy needs.

Branching out

The 16th conference IAWE on Wind Energy will take place in Florence, Italy, 27-30 August 2023. The conference gathers together hundreds of top experts from all over the world (professionals, academics, researchers, corporate company reps. and major stake-holders in Wind Engineering. Check this link for information.

"Energy islands powered by the offshore renewable resources unlock ocean's potential and hold the key to a sustainable future."

–Prof Carlos REBELO, the Action Chair

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Action Outputs

Finnish wind power market is booming - wind power capacity increased by 75% in 2022

By Anni Mikkonen (pictured), CEO of the Finnish Wind Power Association

The wind power development started slowly in Finland in the beginning of 2010's. In 2012 less than 1 % of the Finnish electricity consumption was covered with wind power. The game changer was the feed-in-tariff law that stepped in force in 2011: it resulted into a strong project pipeline and efficient supply chain. Since then, the growth of the industry has been rapid. In 2022 already 14 % of the Finnish electricity consumption was covered with wind and on the bases of the projects currently under construction it is known that some 33 % of the Finnish electricity consumption will be covered with wind power by 2026.

Although wind power construction in Finland started moderately slowly, Finland is now one of the first European countries to build onshore wind power without Governmental subsidies. The first fully merchant wind turbines came on-line in 2019. Today over 55 % of the cumulative capacity has been constructed without Governmental subsidies.

Long term power purchases agreements (PPA) have played an important role in the financing of the merchant projects. Today growing number of big electricity end-users are buying wind power with PPA contracts but there are also wind farms that sell all the produced electricity into the Nord-Pool electricity market.

Record breaking year 2022 and ambitious national targets

Year 2022 was a record year in Finland. Over 2,4 gigawatts (GW) of new wind power capacity came on-line. This meant a 75 % increase in

the cumulative wind power capacity to total of 5,7 GW. According to the statistics of WindEurope, Finland was one of the top three European countries on capacity installed in 2022. Based on the investment decisions made, it can be said that in 2026 wind power will already cover a third of the country's electricity consumption.

In the big picture one of the key drivers in the wind power development and green transition in Finland is the ambitious target to be carbon neutral by 2035. The target means electrification of industry, heating, and transportation. In the winter 2023 Finland also set the target to produce at least 10 % of the EU's hydrogen targets.

The brutal Russian war in Ukraine has also meant a need to increase the energy independence of Finland. Growing amount of clean electricity is needed to fulfil these targets.

The keys to success

One important key to success has been the fact that Finland has got one of the best TSOs in the Europe. The TSO, Fingrid, is proactive and keen on having discussions with project developers and to plan and build the grid beforehand. Even though Fingrid has speeded up their investment plans there is scarcity of grid availability in some parts of Finland.

Thanks to rapid technological development, since 2017 wind power has been the cheapest electricity production method in Finland. The wind speed in Finland is not as strong as for instance in the UK but the project developers are allowed to use the state-of-the-art technology that lowers the costs and makes the projects feasible. In the planning and permitting the future tip and hub heights are used. For example, in a spatial planning process that is started today the tip height of 350 meters is typically used.

There is no such turbine in the market yet. But it does not matter as one is always allowed to construct a smaller turbine than defined in the spatial plan. The developer does not have to specify the actual turbine type in the permitting either – it is enough that the environmental impacts of the chosen turbine type does not exceed the ones defined in the permit.

Finally, Finland is a large country with small population. There is plenty of room for new onshore wind farms in Finland. Despite that one of the challenges in Finland is the long border with Russia. The co-existence of military operations and wind power is a challenge in Eastern part of Finland.

This has resulted in most of the wind power capacity being situated in a fairly small area in the Western part of Finland. There are many things in favor of placing wind turbines evenly across Finland, so a solution to the challenge between national defense and wind power production is currently being sought.

Today over 99% of the cumulative capacity is onshore. There is only one small semi-offshore wind farm and one small offshore wind farm in Finland. But there is growing interest in offshore wind power in Finland and we predict that the next larger offshore wind farm will be constructed in mid-2020's. As in other parts of Europe, offshore wind power is expected to play a significant role also in Finland's electricity production in the future.

From concept to cost-effective solu
Positive Energy Buildings in four EU

By Alexandra Pfohl, Officer Communications, Media & Outreach. Communications & Member Relations, ICLEI Europe and Andreas Jaeger, Officer, Built Infrastructure & Sustainable Energy, Sustainable Resources, Climate & Resilience, ICLEI

In four European cities, Positive Energy Buildings (PEBs) are offering solutions to the global challenges of climate change and energy security. Their implementation could transform not only local energy supply chains, but provide a blueprint for sustainable, energy secure buildings as the living spaces of the future. The cities of Graz (Austria), Helsinki (Finland), Valladolid (Spain) and Hasselt (Belgium) are separated by several hundred kilometres and shaped by different population sizes, regulatory frameworks and local climatic conditions. Like many other European cities, however, they share the same challenge: Bringing emissions down, while ensuring a stable, sustainable energy supply.

These cities' ambition to find innovative solutions for their specific local contexts is what made them unlikely but ideal collaboration partners for the EU Innovation Project EXCESS. A project in which 21 European research, technology, business, and urban transition experts came together to demonstrate that cost-competitive, plus-energy building solutions are attainable across European climatic zones.

What began as a Horizon 2020 project in 2019 has resulted in four demonstration buildings being built either from the ground up, or being refurbished and adapted from and for various different purposes. The building projects range from constructing an entirely new apartment complex in Helsinki (Finland) to the creation of a PEB social-housing complex in Hasselt (Belgium). Projects to redesign a former industrial feed silo in Graz (Austria) and for the deep renovation of a historic palace in Valladolid (Spain) are also underway.

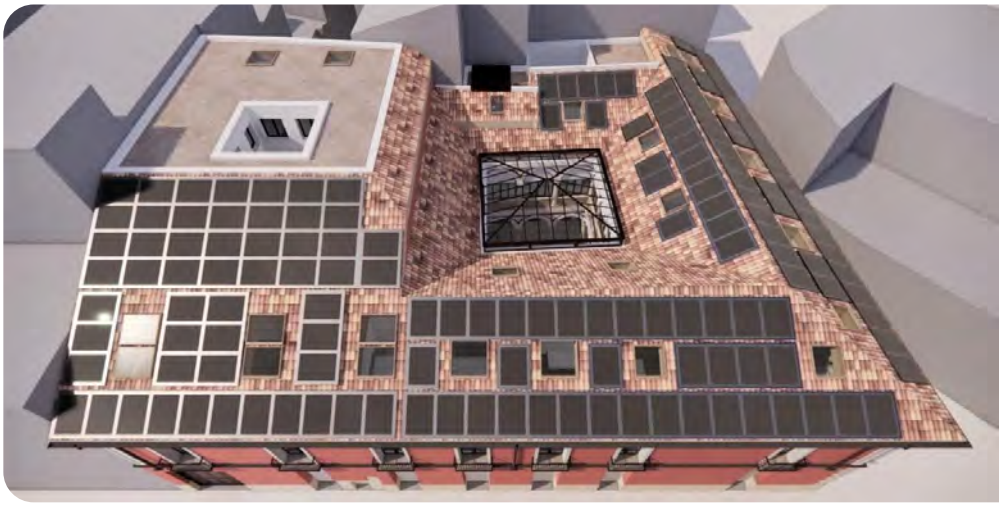
Whereas nearly-zero energy buildings have increasingly become standard for new construction, the energy concept of the four buildings is looking to go one step further. By designing **buildings that produce more sustainable energy than they consume**, the PEB concept enables a building to produce excess energy beyond building self-consumption. The excess energy can be fed back to the local grid or benefit the energy supply of neighbouring buildings or services. PEBs could hence play a critical role in compensating for the energy demand of buildings that cannot become energy neutral, as well as in the electrification of carbon intensive sectors and services, such as public and private mobility.

In spite of these benefits, the cost-intensive and complex nature of implementing plus-energy solutions has long hampered the broader roll-out of the concept. PEB solution packages have to be tailored to buildings of different shapes, sizes and uses, climatic conditions and regulatory contexts. Hence, whereas abundant sunlight in Southern Europe makes cooling a primary concern and solar power an effective choice, more northern cities need to address heating demand effectively from ground sources or wind energy. The PEB buildings in Hasselt and Valladolid are hereby pioneering solutions that could provide a blueprint for addressing an ageing building stock and skyrocketing energy price across Europe.

Installation of a wind turbine to reach plus-energy standards for a social housing complex in Hasselt (Belgium)

The PEB building in Hasselt (Belgium) consists of 20 apartment units intended for social housing, part of a bigger residential complex. The building supplies neighbouring buildings with surplus energy from the sustainable energy generation system installed on its roof and central basement. This includes electricity production via PVT panels,

tion: cities



Solar panels to cover the roof of a 16th century Renaissance Palace in Valladolid (Spain)
Photo: U·rb atelier

a small roof wind turbine, as well as geothermal heat pumps connected via a small district heating network. A smart Building Energy Management System optimises and synchronises energy production and demand. With inhabitants moved in and energy systems running since 2021, the Hasselt building proves that positive energy standards can be achieved cost-effectively. What is more, the building shows high energetic performance can go hand in hand with creating modern and affordable living spaces.

In Valladolid (Spain), project partners focused on testing solutions to decarbonise Europe's historical buildings, which currently represent more than 30% of the entire EU building stock and are responsible for more than one third of the total energy consumption of the residential sector. Whereas historical buildings are part of Europe's unique cultural heritage, they are also a major challenge on the path towards EU carbon neutrality by 2050. This is due to the difficulty of applying energy measures, while safeguarding architectural values. Focusing on a highly efficient thermal envelope and the development of a prototype smart energy system, EXCESS developed a solution package that will safeguard the historical facade of the 16th century palace. The energy concept of the building is designed for the local mild temperatures, and high solar radiation, by maximising electricity production from conventional PV panels installed on the roof. The panels will supply energy for collective household self-consumption and storage, with excess energy to be made available via two EV charging stations for local electro-mobility and the local energy grid. 30 kWh lithium batteries will ensure flexibility and continuous supply. Domestic hot water will come from additional 55 KWe PV, 2,8 kWe hybrid photovoltaic / thermal PVT panels, with a 40KW heat pump to be installed for heating and cooling. The transformation into a residential PEB building is hence contributing to the building's preservation and provides an important example for the deep renovation of Europe's protected buildings.

While these buildings were developed for different contexts, they all offer a glimpse into what could be the path towards, as much as the result of, a sustainable building stock. The EXCESS buildings show that plus-energy houses are attainable with benefits for occupants and actors across the construction and renovation value chain.

The biggest challenge to the building stock transition is no longer technical, but often of legal and organisational nature. It is often more complicated to commercialise surplus energy than it is to generate it. It will be up to the optimisation of political and administrative processes to unlock the mainstreaming of proven technological solutions packages.

The hydrogen revolution is no solo effort – the need for hydrogen partnerships

By Dr. Thomas Hillig, Managing Director, THEnergy

The shift towards a green hydrogen economy is expensive – experts expect investments of more than a dozen of trillion euros from now to 2050. It is obvious that no country in the world can handle this unprecedented challenge by itself. The need for cooperation manifests itself more and more often in hydrogen partnerships that can cover research, development, regulation, pilot projects or even agreements about traded hydrogen volume.

The Nordics have the Nordic Hydrogen Partnership. UK and South Africa launched a hydrogen cooperation last December. Germany cannot get enough of hydrogen partnerships and initiated them amongst others with Angola, Arabia, Australia, Canada, Chile, Japan, Namibia, Nigeria and South Africa. The list is long and could be continued: hydrogen partnerships are on everyone's lips.

Mere partnership announcements are often not worth the paper they are written on

As we all know from our private lives, a partnership can mean pretty much anything. Just the announcement of a partnership often is not worth the paper it is written on. Hydrogen partnerships become interesting as soon as money is put on the table – particularly true if the partnership is closed between uneven partners: richer and poorer countries, potential exporting and importing countries.

This money can be for research and development, education and training, harmonisation of legislation, or specific projects and scaling up programmes. For the latter, Germany proposes and interesting approach: double-sided auctions for green hydrogen and hydrogen derivatives.

An auction many hydrogen players won't be able to resist

In December, Germany launched a €900 million support of auction schemes for green hydrogen and power-to-X (PtX) imports. The German government supports the purchase of hydrogen on the world market from non-EU countries at the lowest price with auctions via 10-year purchase agreements. With a second auction series the hydrogen is then sold to the highest bidder within the EU – at a lower price and on the basis of shorter-term contracts.

The price difference will be compensated by an H2 Global investment vehicle. H2 Global is a foundation set up by mainly German players such as Siemens

Energy, ThyssenKrupp, Linde, VNG or Deutsche Bank for accelerating the ramp up of green hydrogen. H2 Global's investment vehicle received the €900 million support from the German government.

Green hydrogen auctions: sell whatever you want?

The auction approach must stick to strict rules in order to be successful. The main point to mention here is the nature of hydrogen and its derivatives. To justify spending taxpayer's money, it must be ensured that the auctions are catalysts for accelerating our move towards a hydrogen economy. Most experts agree that the colour of hydrogen should be green – in the future also the economically most viable solution as costs of green hydrogen will keep on decreasing.

It is important to really focus the efforts on green hydrogen and ensure that no taxpayers' money is used to establish a transition technology such as blue hydrogen (based on natural gas – but with carbon capture and storage). Technology-wise there is no overlap between green and blue hydrogen generation. Every euro invested in blue hydrogen is a euro lost for leveraging the experience curve effect of green hydrogen.

Transportation of hydrogen

Hydrogen will be transported from overseas as liquified gas in large special hydrogen tankers. This is similar to what we know from LNG, but not the same as LNG remains liquid at "only" -161.5°C while hydrogen requires - 252.8°C. That means that transportation costs for hydrogen are much bigger than for LNG. From a European perspective a ton of hydrogen in Australia is worth significantly less than in Morocco. This must also be reflected to some extent in hydrogen auctions – for example by considering prices delivered to Europe.

In an ideal well-functioning market for hydrogen similar to the electricity markets, delivery distances could no longer be a problem. The purchaser would not receive hydrogen molecules generated in the facility with which the contract is signed, but actual deliveries would optimise hydrogen transportation.

No risk, no reward

Many developing countries might see in green hydrogen the new oil, but there are also risks that need to be addressed. To quickly bring costs down many hydrogen players think big. So big that new hydrogen plants could make up for a substantial part of the national GDP and create dependencies.

Like for mining, it is important to select the right international partner companies and to come up with a suited framework regulation. Although we talk about renewable energy-based hydrogen as green, one aspect is tricky and often overlooked: water. By exporting hydrogen, a country is also indirectly allowing the export of the water needed for the electrolysis process. In many countries, water desalination must play a major role in the future for green hydrogen production.

Recommended links

1. https://www.irena.org/Publications/2022/Sep/Breakthrough-Agenda-Report-2022
2. https://www.iea.org/reports/global-hydrogen-review-2021

About the author

Dr Thomas Hillig is managing director of THEnergy, a boutique consultancy specialised in innovations for the energy sector. The consulting focus is mainly on microgrids, energy storage, hydrogen and decarbonization for commercial & industrial clients.

Dr. Thomas Hillig is a digital ambassador of the European Sustainable Energy Week, of which European Energy Innovation is a media partner. Registrations open in April 2023.

Energy Transition = Energy Security!

Over 650 experts from 60 countries discussed this and more at the World Sustainable Energy Days (WSED) in Wels, Austria, from 28 February to 3 March. The WSED are back in full strength in Upper Austria, a leader region in the clean energy transition.

"The energy transition has a critical role in securing our clean energy future. Under the motto "Energy transition = Energy security!", the 2023 edition of the World Sustainable Energy Days presented concrete policies, technologies and markets to get us there. Over 650 experts from 60 countries came together for the event in Wels, Austria, from 28 February to 3 March. It is wonderful to see participation back up at pre-corona levels", reports Conference Director Christiane Egger.

The WSED are an international conference on the energy transition and global climate neutrality. It is organised by the energy agency of the region of Upper Austria, OÖ Energiesparverband. Upper Austria is a perfect location for the event: Through significant increases in energy efficiency and renewable energy, greenhouse gas emissions from buildings in Upper Austria were reduced by 36% in the last decade. Renewables already supply 32% of all primary energy and 68% of all space heating.

The WSED offered a comprehensive package of events and networking opportunities for the entire energy transition sector.

European Energy Efficiency Conference – to REPower the EU

The price crisis, multiplying signs of climate change, and threats to energy security urge us to act like never before. REPowerEU reflects this urgency and provides new momentum for the energy transition.

On 2-3 March, the European Energy Efficiency Conference showed how to raise the pace of change, how to increase acceptance, trigger investments and get things moving. It offered delegates complementary conferences including the Energy Efficiency Policy Conference, the Industrial Energy Efficiency Conference, the Smart E-Mobility Conference and Innovation Workshops.

The event featured an update on the new EU directives and funding, presented key innovations for the industrial energy transition and informed about smart e-mobility. Experts from all over the world discussed latest research results, successful energy efficiency policies and programmes, and presented innovative best practice examples.

European Pellet Conference – separating facts from fiction

As a CO_2-neutral fuel, sustainable bioenergy has a key role to play in decarbonising and securing our energy supply. In 2023, the European Pellet Conference showed the importance of pellets in responding to the energy crisis and presented latest trends in markets, policies, technologies and innovations. With more than 400 participants each year, it is the largest annual pellet event worldwide and helps experts stay on top of developments in the pellet and bioenergy world.

Christiane Egger, Conference Director of the World Sustainable Energy Days

The European Pe llet Conference 2023 took place on 1 March. The strategy session presented the policy and market context for the clean energy transition and provided input on how to deal with the current challenges. In the panel discussion “The future of wood pellets”, leading biomass experts shared their insights on how to separate facts from fiction on topics such as forestry, air quality and sustainability.

The event showcased cutting-edge developments and R&D results in the pellet and bioenergy sectors and start-ups presented their innovations for the pellet market. Also, international experts offered updates and outlooks on pellet markets around the world.

The energy transition needs young bright minds

On 28 February, the **Young Energy Researchers Conference** presented the work and achievements of young energy researchers in the fields of biomass and energy efficiency. 90 papers from over 40 countries were submitted for the 2023 edition. These were reviewed and evaluated by a high-level international scientific committee. Selected papers were invited for oral or poster presentation. The Best Young Energy Researchers Awards were a highlight of the event!

The programme of the WSED was rounded off with a poster presentation, valuable networking opportunities and the “Energiesparmesse”, a leading tradeshow on energy efficiency and renewable energy where Austrian and international companies presented their latest product innovations.

World Sustainable Energy Days 2024 – Call for Papers & Speakers

The next edition of the WSED will be held from **6 – 8 March 2024** in **Wels/Austria**. The deadline for the Call for Papers & Speakers (including for the Young Energy Researchers Conference) is **10 October 2023**.

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www.wsed.at

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Confirmed speakers include

Carla Detrieux
Director of
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Global Power
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Markus Mildner
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