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Connecting Europe's Stakeholders in Energy and Transport

OFFSHORE RENEWABLE ENERGY

ENERGY INTENSIVE INDUSTRY DECARBONISATION

THE FUTURE OF BIOENERGY IN EUROPE

LEVEL(S) – SUPPORTING THE WORK TO FUTURE-PROOF OUR BUILDINGS

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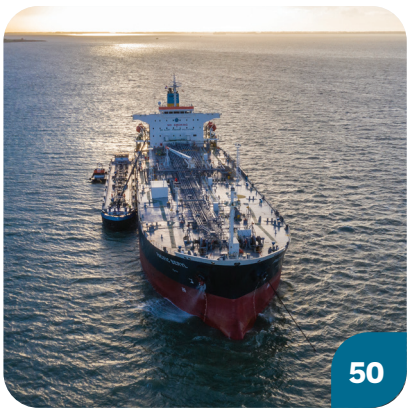

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Foreword

"There cannot be a crisis next week. My schedule is already full."

It is quite possible that Henry Kissinger's famous plea would have gone unheard in the pandemonium that has accompanied the pandemic for a year or so. As we grapple with huge economic, social and political fallout, might we have become distracted from the fight against climate change?

Not a bit of it.

EEI is delighted that Commissioner for Energy Kadri Simson sets out in this issue the role of Offshore Renewable Energy and Innovation. Striking a note of realistic optimism, she reminds us that our dependence on fossil fuels must come to an end, that a new age of renewables must begin - and what the Commission is doing about it. A central policy is the Green Deal: "leading the charge", she says, "is Offshore Renewable Energy", which should comprise 340GW capacity by 2050. Not to understate the problems ahead, she outlines how three changes in focus are necessary: from borders to basins, so that national boundaries do not hinder development of a collective resource; from concentrated to connected, meaning that the necessary grid infrastructure needs to be developed; and from energy-only to economy-entirely, in order that the whole value chain is involved. Her optimism stems from the observation that many offshore technologies are at a relatively early stage of development: for example, floating offshore solar clearly has colossal potential by virtue of the space available to it, while wave energy could supply 10% of global electricity demand. To underline that ambition, Simson cites the Danish plans for artificial islands and the EU's current leadership in technology and intellectual property.

Reviewing the growing global commitment to climate neutrality, Ville Niinistö MEP assesses EU strategy and encourages support for green (as opposed to blue) hydrogen; and for solutions rather than stop-gap measures to maintain Europes' global green leadership. Elsewhere, Kestutis Sadauskas reviews the Level (s) programme that sets out underpin renovation, energy and resource efficiency in the building sector. It addresses the full lifecycle of buildings themselves, as well as ergonomic considerations such as comfort and value.

Linking the fight against climate change with the protection of natural ecosystems, Antonella Battaglini highlights the role of the Offshore Coalition for Energy and Nature (OCEaN). Echoing Commissioner Simson's estimates for installed capacity, Battaglini explores three key elements of offshore RE strategy and discusses how one - grid connections - integrates offshore generation with consumption on land.

We are pleased that Angela Sainz Arnau examines the role of biogas and biomethane in the decarbonisation of the European economy. Current production could double by 2030 to 467TWh equivalent, she says, and quadruple by 2050. Apart from direct injection into the gas network, biomethane can contribute to decarbonising transport: for a 40-tonne truck, weight considerations favour bio-LNG, which could also drastically lower shipping emissions, as well as enhancing the circular economy lying at the heart of the Green Deal.

Rahm Emanuel encouraged us never to let a serious crisis go to waste. It is, he says "an opportunity to do things you think you could not do before". The very definition of Innovation, you might think.

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

Michael Edmund, Editor

Offshore Energy: Innovation meets Ambition

By Kadri Simson, EU Commissioner for Energy

Innovation is an expression of hope in the future and a refusal to accept things as they are. This is the mind set we need as we tackle climate change: global reliance on fossil fuels must come to an end and the balance of power must shift towards a new age of renewables.

The scale of this change cannot be underestimated. Through the European Green Deal, we have set out a roadmap for different measures that can feed in to this overarching objective of reaching climate neutrality in Europe by 2050. Building on this target, EU leaders recently endorsed our medium-term ambition of achieving a 55% reduction in greenhouse gas emissions by 2030. And innovation – doing things in better, new ways - will play a key role in getting us there.

One of the sectors leading the charge is offshore renewable energy. Aware of the enormous contribution that this sector should make to our decarbonisation ambitions, the European Commission published the Offshore Renewable Energy Strategy last November. Therein, we have set our sights on 300 GW of offshore wind and 40 GW of ocean energy across the European Union by 2050. By 2030, our target is at least 60 GW of wind and 1 GW of tidal and wave energy capacity.To acheve this , we need to change the entire system surrounding offshore energy in Europe.

The strategy lays out our way forward for reaching these goals, reduce costs, and optimise our regulations. Significantly, it opens doors for individuals and companies to bring their best innovations to market. In this way, innovation is not only a matter of tools, it is also a matter of ideas. The strategy paves the way for a new way of thinking about our offshore ecosystem in Europe.

First, we need to move from borders to basins – enhancing cross-border cooperation to build on our collective natural resource is key for scaling up in a cost-effective way. The shift in thinking will also mean moving from concentrated to connected, ensuring the creation of infrastructure to enable the renewable electricity generated to reach the grid and the end user in the most efficient way possible. In this context, the European Commission has launched a proposal for the revision of the TEN-E regulation that includes a framework for onshore and offshore grid infrastructure development.

The offshore strategy will also usher in a shift in thinking from energy only to economy entirely. It is not just about the renewable energy industry, it is about growing a value chain stretching all the way inland, even to those countries without direct access to the sea. Taken as a whole, this evolution in the European offshore energy ecosystem will create greater support and opportunity for innovations to move from idea to market.

One of the most exciting aspects of this sector is that so many of the technologies are at such an early stage, affording so much scope for future development. As I write this, bottom-fixed offshore wind is the only technology which is at a mature commercial stage, however, floating offshore wind turbines are now being developed. There are many other technologies and advances at early stage development beginning to appear over the horizon that could bring significant momentum to the clean energy transition.

Wave energy, for example, has the potential to produce 10% of the world's electricity, according to the International Energy Agency. Tidal energy, that is using tidal currents to drive underwater turbines, is another area where progress is being made towards harnessing this natural resource efficiently. We are also witnessing new hybrid areas at the intersection of renewables: floating offshore photovoltaic panels for example are in the pipeline. Direct current grid technologies, such as high voltage direct current converters and systems, can efficiently convey huge amounts of offshore renewable energy to land, enabling the seamless integration of high shares of renewables.

Writing about such innovative technologies can seem more dream than reality at times. But recently we have been inspired by real examples of how these technologies can take shape: for example the announcement of Danish plans to establish two offshore energy hubs – in the Baltic and North Seas – one of which will be an artificial island 80km from the shore. The intention is to create initial capacity of 5 GW with a view to subsequent expansion to provide a capacity of 12 GW in total.

This example from Denmark belies the position of Europe in the world of offshore energy. The EU is the global technological leader in offshore wind and ocean energies, an unsurprising fact if we consider our natural heritage of five sea basins and plentiful windy coastlines. In 2018 EU countries represented eight out of the top ten global exporters of wind turbines and EU companies currently hold 66% of the patents in tidal and 44% in wave energy.

This head start is an advantage if we want to become the world powerhouse of offshore technologies. This is the time to build on the political and technological momentum to lay firm foundations for an innovative offshore energy system. If we succeed, in the years to come when people think of offshore energy, they will think of Europe.

SOCLIMPACT

SOCLIMPACT: Climate Change impacts on European islands

Building a common framework for assessing CC impacts and adaptation pathways at island level

SOCLIMPACT is a research and innovation project funded by the European Commission under the Horizon 2020 programme. The project aims to model downscaled Climate Change effects and their socio-economic impacts on European islands and archipelagos up to 2100, and to assess alternative adaptation pathways.

The application is based on twelve case studies of European islands and outermost regions: French Antilles, Azores, Balearic Islands, Fehmarn Island, Canary Islands, Crete, Cyprus, Madeira, Malta and Sicily. Four key sectors of the EU blue economy were analysed: energy, tourism, maritime transport and aquaculture. Finally, estimations of the impacts of climate change on the islands' socio-economic system were made by combining structural and functional linkages between islands and the rest of the EU, and by implementing a newly combination of two general equilibrium models.

The research work on each island led to the following results:

- Downscaled projections of climate change risks (sea level rise, flooding, beach loss, seagrass evolution, fire danger, infectious disease outbreaks, among others) for two scenarios RCP2.6 (low emissions scenario) and RCP8.5 (high emissions scenario) and different time horizons, namely a baseline period (1965-2005), mid-century (2046-2065) and end of century (2081-2100). See Modelling of CC Impacts.

- An iterative risk assessment which aims not only to assess the risk, but also to monitor vulnerability and exposure, which evolve over time and respond to human interventions.

- The analysis of potential economic impacts on the four blue economy sectors, taking into account specific hazards and risks, and applying discrete choice experiments and value transfer techniques.

- The socio-economic implications of these impacts by applying two general equilibrium models. Changes in mean temperature, sea level and precipitation rates, that are expected to affect energy consumption, tourism flows and infrastructure, have been used as inputs to assess the effects on 14 sectors of economic activity, GDP, consumption, investment and employment.

- The co-assessment and ranking with local stakeholders alternative adaptation pathways, that are framed by the geographical and socio-economic conditions of each island, and the future climate change scenarios.

The novelty of this project has been to effectively use a participatory process involving 12 island organisations, stakeholders and academics to develop accurate and adapted climate change projections for EU islands, and to correlate the relationships between CC scenarios, biophysical impacts and island socio-economic conditions. The project addressed the problem of the lack of high-resolution data by expanding the Med-Cordex database and the size of the unpublished atmosphere-ocean coupled simulations. While the Mediterranean region is sufficiently covered by available wave and tidal data, climatological datasets describing tides in the Atlantic Ocean, and specifically for the islands analysed, are generally lacking. Specific new simulations have been carried out, with satisfactory results.

But the most powerful service provided by SOCLIMPACT is the Regional Exchange Information System (REIS) and the Adaptation Support Tool for Islands. They allow stakeholders not only to access specific knowledge generated by the project, but also to have the opportunity to discuss intensively, propose new ideas for collaborative work and establish a reference point for Adaptation beyond island boundaries. Through its networking area, the platform is open to bring solutions in support of climate resilience management in EU islands and outermost regions, and to incorporate actions as well as methodologies for CC research to the EU coastal zones and beyond.

The final meeting of the project will be held on 23 March 2021. The conference is entitled "First European Island Summit on Climate Change" and is the first step towards further joint events. The meeting will bring together academics, EU island representatives and panellists from the European Commission to discuss co-benefits and adaptation pathways over time for building more resilient archipelagos. (Registration HERE).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776661.

Sustainability and digitalisation go hand in hand

By Steen Schelle Jensen, Head of Product Management, Kamstrup

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

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

The digital utility

As part of the revised Energy Efficiency Directive (EED), the requirement to install only remotely read smart meters for heat consumption became effective as of October 25th, 2020. While its original driver is to empower consumers by making monthly consumption data available to them, there are also clear benefits to be reaped by utilities ready to embrace the digital transformation that smart metering prompts.

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

Improving daily operations

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

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

Optimising asset management

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

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

Enhancing end-user involvement

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

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

kamstrup.com

Level(s) – supporting the work to future-proof our buildings

The EU Green Deal, launched in December 2019, set out the EU's climate-neutral ambitions. Under this umbrella, the new Circular Economy Action Plan, launched in March 2020, provides the agenda for sustainable growth and a green EU economy, and the Renovation Wave, published in October 2020, presents a new strategy to boost renovation and to drive energy and resource efficiency in the building sector.

It is in this context that Level(s) was launched, in October last year, to underpin actions in both these initiatives.

"The concept behind the Level(s) framework started to take form once the building sector became a key area of action for the European Commission in terms of resource efficiency, circular economy and whole life carbon", recounts Kestutis Sadauskas, Director for ENV.B – Circular Economy and Green Growth at the European Commission's Directorate-General for the Environment (DG ENV). "We realised that, to truly achieve sustainable transformation in the building sector, we need a common language that not only could be used across the building chain, but also help with data comparison across different countries. This work started already in 2015, and was a natural continuation of objectives set out in the Roadmap to a Resource Efficiency Europe a few years earlier".

Since then, the awareness of e.g. the carbon impacts from the whole life cycle of buildings has grown rapidly.

"The timing for the launch of Level(s) could not be better", explains Sadauskas. "We now find ourselves in a situation where more and more Member States realise that in order to reach their carbon objectives, it is necessary to look at the full life cycle of buildings. An enormous

peak of carbon is emitted already before the building starts being used, from material production, transport and construction. Design based on circularity, with lifespan extension, adaptable and flexible buildings, assembly and disassembly of building elements, deconstruction as opposed to demolition and clever low carbon design solutions, this has the potential to reduce these embodied carbon emissions significantly. This is at the core of Level(s)."

Just last year, the International Resource Panel on the one hand, and the European Environment Agency on the other, pointed to reduction potentials of embodied carbon of 60-80% up to 2050.

"When you combine this with energy efficiency for heating and cooling etc, then you can truly talk about future-proofing of buildings", continues Sadauskas. "Level(s) is a broad framework, which covers key areas during the full life cycle of buildings, carbon, material, water, but also health and comfort, resilience to climate change and risk and value. Member States are gradually looking at how to incorporate aspects like these, and we believe Level(s) can be the answer to many of their questions."

Level(s) was designed to provide a basis for discussing, analysing and understanding the full life cycle, suitable for the majority of buildings being built or renovated. By far most projects do not go through certification, and Level(s) is not a certification scheme. Level(s) is for those which want to start the sustainability journey and to reflect on objectives linked to sustainability performance from the beginning of a project and throughout, to understand the impacts of different design options. Moreover, having been directly involved in the development of the Level(s) methodology, many existing certification schemes are currently looking at how to align themselves with the common language that the Level(s) indicators provide. In this way, Level(s) is also likely to impact certification of buildings.

The development of Level(s), which included a substantial test phase across the EU, has been a great collaboration between building professionals, national and regional authorities and the European Commission.

"It has been fantastic to witness the enthusiasm of the building sector, with companies and authorities from start to end of the building chain, in developing and testing Level(s) as a reliable, future-proofed framework", remarks Sadauskas. "It bodes well for a sustainable future in the building sector, and for the adoption of Level(s) across Europe now that the final version of the framework has been launched".

"With Level(s) helping to define metrics and methods, people can now talk about the targets instead of discussing the "best" calculation or assessment methods.", explains Anna Braune, Director of Research and Development at the German Sustainable Building Council (DGNB), and involved in the testing of Level(s) on the Knauf Insulation training centre in Slovenia, a collaboration with Knauf Insulation and the Slovenian Ministry of the Environment and Spatial Planning.

The DGNB believes that widespread adoption of Level(s) will be primarily motivated by the desire and commitment of Member States to contribute to a greener future. "First, public authorities and decision-makers must say 'Yes, we want to decarbonize our building activities over whole life cycle and promote low carbon buildings today. Yes, we want to contribute to the shift towards a real circular economy, and we will do this by securing healthy and comfortable spaces, resilient and adaptable for future climate, without excessive future costs, at low risks", says Anna Braune. "Once they commit to these objectives, they will use Level(s) – or tools which incorporate Level(s) indicators – on their own activities, and include it as a basic requirement for permits or funding attribution for all cities, regions, and countries."

"The end goal is that, by using Level(s), users are investing in a cost-effective framework that helps them future-proof their building projects in line with circular economy, whole life carbon performance and other green policy goals", explains Sadauskas. "We know from the great collaboration in the last six years, that the building sector sees this as a common language. In a way, we are not just harmonising data and metrics: we are also harmonising the built environment's vision of a sustainable future. This is something we also want to see reflected in the national Recover and Resilience Plans."

The European Commission is taking Level(s) further. E.g., Level(s) is the basis for the work to develop new Green Public Procurement criteria, it forms an important part of Built4People – the new public private partnership under Horizon Europe, and it will bring the definition of circularity and sustainability to the newly kicked-off Bauhaus initiative.

The Level(s) framework was officially launched on 15 October 2020. To know more or get involved in this European Commission led framework for sustainable buildings, visit: **https://ec.europa.eu/environment/topics/circulareconomy/levels_en** or, contact Ms Josefina Lindblom, leading the work on Level(s) at DG ENV, at **env-levels-testing@ec.europa.eu**

A Roadmap for Collaborative Concentrated Solar Power (CSP) development in Europe

By Yolanda Lechón. CIEMAT. Spain, Pablo del Rio. IPP-CSIC. Spain, Inga Boie. Fraunhofer ISI. Germany and Alexandra Papadopoulou. University of Piraeus. Greece

The decarbonisation of the electricity sector through the deployment of renewable energy technologies is a key element of the European climate change strategy and ambitious renewable energy targets have been set on the European level. The absence of mandatory targets on the national level emphasizes the relevance of collaborative approaches to reach the envisaged renewable energy share on the European level.

With rising shares of variable renewable energy, electricity system flexibility gains importance. Energy storage and dispatchable electricity generation technologies are particularly important to help balance the in-feed of variable renewable energy sources (RES). Concentrated Solar Power (CSP) with storage, as dispatchable renewable energy technology, could contribute to the deep decarbonisation of the European Energy system by providing sustainable and flexible electricity. With vast solar potentials in Southern European countries, CSP could thus be a suitable technology option for collaborative renewable energy projects among EU Member States.

However, even though RES cooperation mechanisms were introduced by the European Commission already in 2009 to allow the EU Member States to reach their binding 2020 renewable energy target shares with joint efforts and potentially at lower costs, they have hardly been used and never involved any CSP project. The EU H2020 project "Market Uptake of Solar Thermal Electricity through Cooperation – MUSTEC" (https://www.mustec.eu/) has analyzed the framework conditions for the collaborative development of CSP projects.

In the past few years, global CSP deployment has slowed down and shifted away from Europe. The European CSP industry is facing severe challenges and some of the previously dominant European companies are now struggling with competition from new, mainly Asian businesses. There is a concern that this trend could result in the disappearance of many European companies and, eventually, in the dissolution of innovation networks in the field of CSP. The levelized cost of electricity (LCOE) of CSP with an average value of 0.12 USD/kWh, has seen a clear downward trend in recent years but it needs to be reduced further to make CSP more competitive. Whereas the cost outlooks for CSP are bright, the market and policy outlooks are troublesome and support, to keep the industry alive and prevent the CSP sector from entering into a bust phase, is urgently needed.

Policymakers on the European and national levels could address the identified issues and enable CSP cooperation by creating favorable framework conditions and adopting specific instruments and design elements within the existing policy strategies. Besides continued and targeted R&D efforts to enhance the efficiency of CSP power generation, key elements to support this development comprise the creation of a favorable investment framework and the provision of financing tools that help to hedge the risks related to project implementation. Against this background, also a stable political framework and continuity in renewable energy policy on both national and European level are particularly crucial factors.

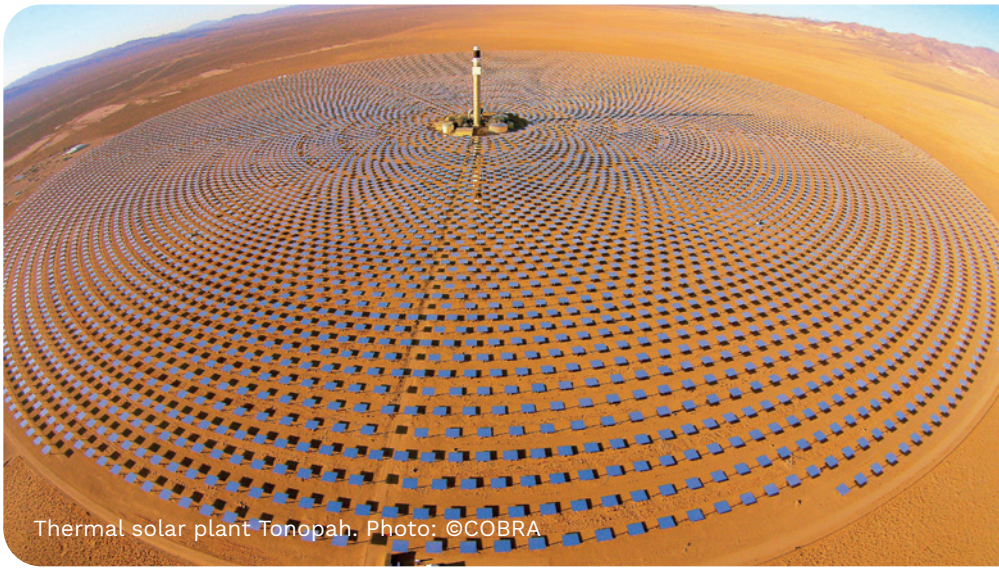
Equally important as the reduction of generation costs is the creation of a favorable market environment that allows for CSP to be deployed profitably and to leverage its strengths. First and foremost, this requires ambitious energy and climate policies that set the appropriate price signals and reflect the value of flexibility in the electricity system. In this context, CSP should be seen as a complementary technology to PV and wind energy as it can deliver firm and flexible power and contribute to balancing the electricity system.

The creation of technology-specific support, which takes into account the particular features of this technology and the provision of financing instruments that help to hedge the risks associated with the implementation of such large-scale projects are further core elements. Especially the design of the auctions for renewable energy support is crucial. If the auctions aim to encourage the uptake of CSP projects and CSP collaborative projects, they

should prioritise the inclusion of two main design elements: they should be technology-specific and they should value the dispatchability feature of the technology. This dispatchability feature could be included by specifying a time-diverse generation profile, by offering higher remuneration at times of higher demand, or by requiring a minimum number of hours of storage as a pre-qualification.

To stimulate and facilitate the use of RES cooperation mechanisms among EU Member States, a clearer statement and a more targeted supportive framework on EU level are crucial to pave the way for cooperative renewable energy development in the future and to hedge the additional risks and reduce the added complexity of developing renewable energy projects cooperatively. This implies the further development of an effective supportive regulatory framework on EU level and the targeted design and application of existing instruments under the recast RES Directive 2018/2001 as well as the efficient use of the available funds for cross-border RES projects under the Connecting Europe Facility (CEF) and the RES financing mechanism.

Another important aspect in this regard is the public awareness and acceptance of renewable energy cooperation projects. This is crucial to ensure the long-term sustainability of RES strategies and to avoid local resistance against potential projects in the future. The awareness of the benefits of RES cooperation among the Member States of the European Union is still at an early development stage and skepticism towards collaborative RES projects is common. Thus, to ensure broad public support and avoid opposition to future CSP cooperation projects, basic groundwork needs to be done to spread respective narratives and create awareness for the benefits of renewable energy cooperation projects among the general population as well as all other relevant stakeholder groups, such as NGOs or other relevant local and national stakeholders.


Thermal solar plant Tonopah. Photo: ©COBRA

In summary, to address the identified key issues and barriers to collaborative CSP deployment in Europe, a detailed road map and action plan has been developed where three main fields of action that need to be addressed by policymakers on European and national level are distinguished:

- Political and regulatory framework: Definition of ambitious and technology-specific goals, provision of targeted support, and creation of a suitable market design that recognizes the value of CSP as a dispatchable renewable energy technology.
- Techno-economic framework: Enhancing the competitiveness of CSP by further reducing the LCOE, effectively hedging project implementation risks, and facilitating project financing
- Socio-political framework: Creating a broad public acceptance and awareness for the benefits of CSP and the importance of collaborative European approaches for renewable energy support and establishment of the respective political narratives.

The roadmap and more information about the project can be found at www.mustec.eu

MUSTEC

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Leading with a green industry

By Ville Niinistö, Greens/EFA MEP (pictured)

A lot has happened since the launch of the current industrial strategy. Europe went to a standstill from covid lockdowns, the EU agreed on its recovery measures, which have a green focus, and vaccinations have started so there is hope in the pandemic.

On the climate front the EU has practically agreed to climate neutrality by 2050, but the Climate Law is still in progress. Outside the EU major economies have set carbon or climate neutrality goals for 2050 (UK, Japan, South Korea) and China committed to carbon neutrality by 2060. This shows we are not on this path alone, but we are risking falling behind in case we do not scale up our efforts to provide for the products and solutions to meet the climate commitments. We can always resort to buying clean solutions from others if we fall behind in development, but wouldn't it be better to be the supplier, to sell to others the products, technologies and solutions they need. For this we need a strong focus on taking our innovations commercial, and creating a front runner market that demands

"Hydrogen is not the silver bullet, but a tool to take renewables where direct electrification is not possible."

the cleanest products that will act as a business card to our industries. The new industrial strategy needs to set the EUs industry on a clear and ambitious path to climate neutrality.

Hydrogen is an industrial opportunity and needed in some industrial sectors to be climate neutral. The commission's hydrogen strategy set targets for electrolysers and volumes of renewable hydrogen, while also supporting low carbon hydrogen. So blue hydrogen, which is hydrogen made from natural gas with carbon capture and storage (CCS), is still supported. The commission has said blue hydrogen is a needed stepping stone to renewable hydrogen made from renewable power, but from an industrial point of view, would it not be better to put the focus heavily on renewable hydrogen, as we still have an edge in the technology? And what about renewable power? We know there is no renewable hydrogen if we don't have renewable power, so the first no regret effort is to massively scale up our renewable power production. Only if our renewable power capacity grows in line with electrolyser capacity we are on the right track, and this needs to be on top of renewable power installed to get rid of fossils in the power system.

The parliament is making its stance in the hydrogen strategy. There we hope to see a realistic approach, with focus on making more renewables, and installing the electrolysers close to the no regret end uses that have no other option than hydrogen, that also need it in the long run and replacing existing hydrogen use by renewable hydrogen. Hydrogen is not the silver bullet, but a tool to take renewables where direct electrification is not possible. We need to keep true to the energy efficiency first principle, and not be wasteful with our electricity consumption – the time of a fully renewable power system with abundant electricity is not yet here.

We can also push our neighbours and energy suppliers to shift to renewable hydrogen, by supporting the use of only renewable hydrogen, and using the coming carbon border adjustment mechanism to our advantage. We need to put a price on fossil gas based hydrogen, whether with CCS or not, also taking into consideration the price for the methane emissions in the supply chain. This also makes our european production cleaner, and pushes exporting countries to clean their products as well, if they are to compete on our markets. We need also demand for renewable hydrogen, and for that we need to stimulate lead markets for clean products, and one market could be the automotive sector. I've heard green steel can be 20% more expensive than normal steel. This is not major, but still significant. But when you make a car out of that green steel, the car is only 0.6% more expensive to manufacture.

I would hope that a majority of growingly environmentally conscious consumers would be willing to pay 0.6% more of their car. So depending on how you look at it, the issue is very different – so this transformation is also a communications exercise. But incentives are not always enough, so we need to also consider binding obligations to purchase lower emission products. If we require green products on the markets, they are also more likely to be produced here, and our industries should have a first mover advantage, if they don't doze off.

But to wrap up. We are at a crossroad. We can focus on Europe's past successes, and put our efforts into small improvements and "bridge solutions" that we know are not fit in the long term, while we watch the other global markets become climate neutral. Alternatively we create new European successes and become real global leaders in climate action, and supplying others the means to reach their goals.

H2020 MERLON builds one of the first integrated energy islands in Austria

Güssing, AT – since more than 20 years a small region in the southeast corner of Austria has taken a pioneering role in becoming an energy-self-sufficient ecosystem through an ambitious engagement in renewable energy production. However, ever-growing shares of volatile and intermittent renewable energy from PV plants are stressing the electricity system and threaten the quality and reliability of power delivery. As a result, it becomes more difficult for new renewable generation plants to go on the line. In this rural region – which is representative of many other regions in Austria and the EU – the rather weak electrical network infrastructure is simply not designed to host large amounts of variable distributed generation infeed.

The H2020-project MERLON develops a promising ICT solution that not only increases the local hosting capacity of such areas but also formulates innovative network clusters that can operate both in islanded and in interconnected mode. A holistic modular energy management framework is developed, integrated and gradually deployed at two pilot sites, namely in Crevillent (ES) and in Strem (AT). From the beginning of 2019 a living lab has been established in Strem with households and local business stakeholders participating in demand-response and district-level flexibility optimisation framework. In the pilot buildings with residential and commercial use, the electricity-powered heating/cooling systems are monitored and remotely controlled to provide the essential flexibility to the grid without hampering the user's comfort and considering various contextual information

In addition to the flexibility resources on building level, various existing distributed energy resources on demand and generation side (EV chargers, PV plants, etc.) have been integrated in the MERLON framework together with a large-scale battery energy storage system of 250 kW / 250 kWh. The battery is equipped with MERLON smart management module enabling it to act as the main buffer for flexibility within this energy ecosystem. Finally, a blockchain-enabled flexibility marketplace has been launched in an attempt to establish a market-based approach in the flexibility transactions within the integrated local energy system.

Overall, the MERLON solution offers a set of stand-alone modules and tools for DSOs, Aggregators or other stakeholders of energy communities. These include configuration of virtual power plants, building-level and EV flexibility management, district flexibility forecasting-segmentation and aggregation, and more. At the same time, the modular structure of the framework makes it applicable in different environments and energy ecosystems.

The results of the project activities in Austria and Spain will be demonstrated until the end of the year. In both pilot sites the testbeds are already established, the demonstration scenarios are defined, and the communities have been guided and prepared for the final testing and evaluation phase of the project. During the following months, the validation procedure will deliver the insights and results to refine the MERLON products and provide a market-ready solution for DSOs and Aggregators in the EU at the beginning of 2022.

This project has received funding from the European Union's Horzon 2020 research and innovation programme under grant agreement No 824386.

OCEANERA-NET COFUND: new collaborative projects in ocean energy

Europe is leading the world in the development of ocean energy technologies. The Horizon 2020 funded OCEANERA-NET COFUND project aims to ensure Europe stays in the lead by supporting collaborative innovation and knowledge transfer. Three new projects have been announced under the Second Joint Call, taking the total grant funding for 12 projects to over €10m.

Leixões, Portugal, providing a prototype for WEC4Ports breakwater integration

SEASNAKE, led by RISE – Research Institutes of Sweden, aims to provide a step change in the overall performance of a medium voltage cable system, aiming for a 20% cost reduction while ensuring high reliability and lowering the risks of ocean energy installations. The cable weight will be reduced by introducing a new type of internal armouring, allowing the cable to move with a high frequency and remain functional over a long period of time. It will be lighter, more flexible and easier to install, with a long life-time, even if connected to objects moving with the same frequency as waves on the sea. An environmentally friendly coating based on Selektope™ will minimise the external loads due to marine growth and allow for optimised operation and maintenance. The biological biocide does not kill the barnacle, instead it repels the larva, preventing it from attaching to the treated surface. The new solutions are being fabricated, tested and demonstrated in France, Portugal and Sweden. www.seasnake.eu

WEC4Ports, led by International Marine and Dredging Consultants, will build on SE@PORTS (an OCEANERA-NET project) where a novel hybrid Wave Energy Convertor (h-WEC), using air and water turbines, has been designed. Integration of WECs in port breakwaters represents a realistic solution to set these critical infrastructures on the right track in terms of pairing economic growth with green objectives. The key components and subsystems (e.g. turbines), will be built to be demonstrated in the real ocean environment, at Mutriku test site in the Basque Country, after being experimentally and numerically designed and optimised. Full-scale testing allows for assessing and improving installation, operation and maintenance procedures of these complex power conversion systems as well as obtaining realistic estimations of their performance.

EVOLVE – Economic Value of Ocean Energy – a partnership led by Aquatera, will examine the overall market value of the inclusion of ocean energy in European energy systems. On the path towards meeting European and global emissions and renewable generation targets, a key challenge is maintaining a secure, reliable electricity supply with high penetration of renewable generation. EVOLVE will model future energy generation, supply and demand scenarios to evaluate whether, and if so where and how, ocean energy can make a significant positive and profitable contribution to future energy systems as a secure, clean and efficient source of energy. An iterative stakeholder engagement programme, including policy makers, regulators, system operators and investors, will ensure that the results are relevant and useful.

For further information please contact:

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OCEaN's 18: Collaborating to align offshore energy infrastructure development with nature protection

By Antonella Battaglini, Renewables Grid Initiative (RGI)

The 2020-2030 decade is a decisive period for the EU and its fight to combat climate change, reduce emissions, protect ecosystems and to deliver a fair energy transition and a healthy environment to European citizens. What Europe will do, will greatly influence energy and climate actions around the globe. Indeed, the EU will be updating many of its climate policies and legislations in 2021, and it has already published relevant strategies, including 2020's Offshore and Biodiversity Strategies. Both the EU and its Member States will be spending billions of Euros from the recovery fund, thus stimulating and ideally supporting relevant technologies. It is therefore of paramount importance that we make the right decisions, develop the right policies and implement them within the given timeframe.

Offshore development is expected to play an important role in reducing emissions by providing large quantities of electricity from wind and ocean energy. The European Commission estimates at

least 60GW of offshore wind by 2030 for all of Europe, today some 25GW are already installed and in the run up to 2050 these numbers will increase dramatically[1].
The challenges to exponentially increase the offshore deployment of wind and related grids are complex: Not only are our marine ecosystems already highly depleted and polluted, our oceans are also already full of economic activity and often conflicting interests.

In order to enable the offshore energy expansion through finding environmentally sound solutions, RGI has initiated the Offshore Coalition for Energy and Nature (OCEaN), as one of 18 founding member organisations, including NGOs, wind industry and transmission system operators from across Europe. In its convener and moderator role, RGI acts as facilitator and driver to foster collaboration among marine stakeholders. Launched a few days before the European Commission's comprehensive Offshore Renewable Energy (ORE) Strategy, OCEaN will offer practical, collaborative approaches and solutions for the implementation of the ORE Strategy. A great amount of work is needed to turn its ambitions into clear and practical implementation steps. In this article, I would like to highlight 3 points and suggest how our coalition can support and enhance their implementation.

1) The ORE Strategy confirms that Member States must realise Maritime Spatial Plans (MSPs) and have them undergo an environmental impact assessment (EIA). This is a very important first step. However, we also need to adopt a basin approach for both technology deployment and nature protection. In particular compensatory measures can be more effective when planned on a large scale, in collaboration, beyond national waters and in view of the entire sea basin. In addition,

we need to make sure we plan all the way to full decarbonisation, this will guarantee that today's investments do not prevent future ones. Moreover, we need to ensure our plans prioritise activities in line with political targets and objectives. To this end, we must understand cumulated impacts and fill data gaps to support permitting processes. OCEaN will work on all these issues by promoting best practices and knowledge on cross-border approaches, joint learning, nature-inclusive design options and the sharing of relevant data.

2) This is directly connected to my second point. In order to create the structures for joint learning, for cooperation and inclusive stakeholder dialogue on "environmental and social sustainability of offshore renewable energy" to flourish, the ORE Strategy foresees a "community of practice", in which "all stakeholders, industry, NGOs, scientists can exchange views, share experiences and work on common projects". OCEaN was founded with this exact goal in mind. It provides an open forum for discussion, welcoming all users of the sea, where existing information and experiences are assessed and collated, needs for further research are identified and suggestions are made on how to improve planning offshore renewable energy development for the European seas. We are starting with the Northern Seas but are already planning to expand to all European seas, specifically the Atlantic and the Mediterranean very soon, and later the Black sea. Renewable offshore development should be a joint European exercise and there are many lessons to be learned from the commonalities but also the differences between sea basins.

3) Offshore energy requires grid connections. These have to be planned together. The ORE Strategy has put forward a series of steps to clarify regulatory issues and cost allocation. These are all necessary to support innovative approaches, such as the use of hybrid grid technologies. Still, we need to consider that all energy generated at sea needs to be transported to consumption centres. OCEaN is therefore also looking at impacts of energy infrastructure on land. This does not just include landing points but also how the electricity grid needs to be planned and expanded to accommodate increasing shares of wind and ocean energy. In order to make sure this is the case, OCEaN advocates for stronger linkages between offshore development and grid planning, in the plans for the coming ten years as well as with a perspective towards full decarbonisation. This way, we can understand the implications of increasing shares of offshore RES in the European energy system and the consequences in terms of costs and environmental impacts, especially with regard to space needs and the implications of electrification vs gasification.

Collaboration lies at the core for successfully planning everything we need to consider. A substantial pillar of our energy future will have to rest on the shoulders of successful offshore development. We therefore need to make sure that we do it right – and work on it together, in a collaborative manner, with all relevant stakeholders having a voice.

1. The ORE Strategy states: "Starting from today's installed offshore wind capacity of 12 GW, the Commission estimates that the objective to have an installed capacity of at least 60 GW of offshore wind and at least 1 GW of ocean energy by 2030, with a view to reach by 2050 300 GW10 and 40 GW11 of installed capacity, respectively, is realistic and achievable." Source: European Commission (2020) An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future. COM/2020/741 final

The Ten-Year Network Development Plan scenarios foresee up to 143 GW of offshore wind by 2040 for all of Europe. Source: ENTSO-E (2020) Charts and Figures Underlying Data for TYNDP 2020.

WindEurope plans with a 450 GW vision for offshore wind by 2050.
Source: WindEurope (2019) Our energy, our future.

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FLEXIGRID

Preparing the electricity grid for the increase in renewable generation

Making the grid more flexible, reliable and cost-efficient through the development of innovative solutions. This is the objetive of FLEXIGRID European Project, led by the technology centre CIRCE from Spain and 8 million funded by the European Commission.

The project is putting into practice new tools to allow the distribution grid to operate in a secure and stable manner when a large share of variable renewable electricity sources is connected to low and medium voltage grids.

Concretely, the consortium of 16 partners that make up FLEXIGRID are working on the development of innovative hardware and software solutions to improve the power system flexibility by enhancing the grid hosting capacity of renewables; to increase the observability, controllability and automation of the network systems for the improvement of both the security and resilience of the grid; to mitigate short-term and long-term congestions in the distributed grid from an economically efficient point of view; and to ensure the interoperability and compatibility of the developed solutions with different platforms used by European DSOs.

To achieve these goals, FLEXIGRID is developing four hardware solutions, including the design of transformer substations of the future, a new generation of smart meters, new grid protection devices and a multi-function Edge-computing platform capable of controlling grid assets called Energy Box. In addition, the project is developing four additional software modules addressing fault location, selfhealing, forecasting, operation and congestion management of the grid, and optimisation of thermal energy storage. Finally, a common platform including all the necessary protocols and standards to integrate the mentioned solutions with the DSOs platforms is being developed.

In order to ensure the effectiveness of these solutions, FLEXIGRID is implementing them in eight uses cases which are being demonstrated in four demo-sites: a rural and peri-urban network in the Spanish grid, a hotel in the Greek Island of Thassos; an urban grid in the city of Zagreb accounting congested areas and an isolated valley in the South-Tyrol region of Italy with more than 50% of hydroelectric energy.

Moreover, the project will help to identify and analysing, through constant monitoring of the legislation, the obstacles to innovation under the current local and European regulatory framework. Last but not least, FLEXIGRID partners wish to raise awareness among citizens and other relevant stakeholders on the transition towards a low carbon economy, considering them as active players within the energy system.

The main impacts expected as a consecuence of the implementation of the solutions developed and tested in FLEXIGRID Project are improvements in stability and flexibility of dictribution networks; renewable energies curtailments decreasing; reduction of reinforcements required in the grids, increase in capabilities to manage future energy loads and CO_2 emission savings.

10 years to go: are the winds of change blowing in the right direction for electricity infrastructure?

By Eurelectric's Helene Lavray, Senior Advisor - Renewables & Environment - 2030 Framework Lead and Louise Rullaud, Advisor - Distribution & Market Facilitation - Infrastructure & Flexibility Lead

We have 10 years to build as much as half of the electricity capacity that had been built in Europe over the past century, if we want to meet the decarbonisation ambitions. This additional capacity will come from clean energy sources, with an estimated 470 GW of renewables connected at grid level by 2030. In light of this, investments in generation assets must be coupled with investments in grid infrastructure.

The good news is that multiple avenues for decarbonisation have become available and scalable. Offshore wind is one of them.

Offshore wind is expected to be the fastest growing generation technology by 2030. So far, the North and Baltic Seas have been the prime hub for offshore wind development, and the cradle of hybrid projects in which the grid has a dual function: ensuring the transportation of offshore renewable energy and acting as electricity interconnector. But there is also significant potential in the Atlantic Ocean, the Mediterranean Sea and the Black Sea, and around islands.

A whopping 25-fold increase in EU's offshore wind capacity is expected by mid-century. That means benefitting from 300 GW of offshore wind, up from today's 12 GW. This is what the European Commission is aiming for in its "EU Strategy to harness the potential of offshore renewable energy for a climate neutral future". This will frame the deployment of offshore wind for the next 30 years.

Offshore wind is now a mature and large scale technology with a high capacity factor and falling costs. Europe is a leader in offshore wind development. Even during the COVID crisis it attracted EUR 26.3 billion of investments in new farms that will deliver 7.1 GW of capacity in the coming years, according to WindEurope.

However, this huge clean electricity capacity will not reach consumers

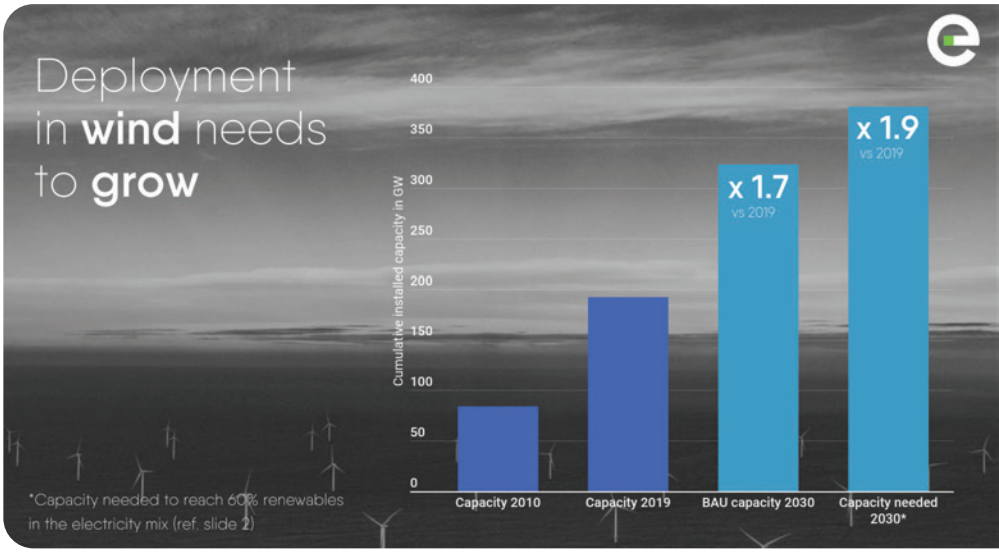
without the necessary power lines connecting it to the shore.

It won't be plain sailing unless the EU shows determination in the implementation of its strategy. Going forward, a clear regulatory framework, adequate market designs, long-term price signals, and higher societal engagement will be critical.

Sufficient deployment of offshore wind will depend on successful coordination between various regulatory initiatives, such as the Regulation on Trans-European Networks-Energy and the Offshore Strategy, which are currently being discussed by EU Institutions. The challenge is to ensure consistency between the regulatory framework and network planning on the one hand, and the permitting procedure on the other hand. This consistency will be crucial to send the right signal to investors.

The slow and complex permitting processes have side effects.

First: the slowdown of new renewable energy installations buildout. Second: slow to no grid developments. Third: a low investment certainty. To counter these side effects it is imperative to quickly and thoroughly implement the new simpler permitting rules.



But this also means that the Maritime spatial planning, which manages the sea activities across borders and sectors, must ensure that offshore renewables can be deployed to the levels needed to meet the EU climate objectives.

Part of the issue could be tackled via the "one-stop shop" per sea basin for offshore grid permitting processes proposed for cross-border projects in the revision of the Trans-European Energy Networks Regulation.

And more broadly, the targets for offshore wind deployment at European level shall be linked to the European electricity network planning via the Ten Year Network Development Plan (TYNDP). This is a very complex, yet crucial exercise for the deployment of offshore wind in Europe as it sets the path for the infrastructure roll-out. On one side, it preconditions the development of European cross-border projects and their access to funding options, such as the Connecting Europe Facility. On the other, it forecasts the long term energy supply and demand considering the ongoing energy transition.

It is therefore high time that transmission operators within the ENTSOs, align the TYNDP scenarios with the EU policy goals and strategies, including the Offshore Strategy. As they focus on aspects which determine infrastructure utilisation, they are also responsible of safeguarding the consistency between scenarios and ambitions. This is because the roll-out of offshore plants would have a major impact on the analysis of the infrastructure needs in the coming five, ten, 20 years.

This high ambition in offshore wind deployment requires major investment in infrastructure. According to the European Commission's estimates, the upscale of offshore renewable energy in Europe by 2050 would cost €800 billion, of which two thirds would be for the associated grid infrastructure. While these costs seem high, the costs of underinvestment are even higher. Rolling out this infrastructure, like the offshore installations and the necessary grid, is an absolute must to meet the net zero ambitions. Therefore, the deployment of offshore renewables and grid infrastructure must benefit from a level of support that is proportional to their contribution to the climate neutrality objective.

COMSYN

Compact gasification and synthesis for flexible production of transport fuels and heat

Concepts for distributed primary biomass conversion and central refining *S. Tuomi, VTT*
An important aspect for alternative fuel processes is their integration into the existing infrastructure. The FLEXCHX and COMSYN process both employ the double integration principle: The fuel process is in close proximity to a source of forest residue or agricultural waste and is integrated to a local district heating network. This way, process off-heat can be utilized. In addition, the decentralized plants form a supply network for the existing centralized refineries.

The FLEXCHX process adds another connection to the existing energy system: By sourcing electricity from the grid when cheap, renewable electricity is available, the product output of the process shifts towards a higher hydrocarbon production thereby decreasing the heat production. This way the process can react to seasonally fluctuating heat demand.

Gasification technologies for small-to-medium scale syngas plants *E. Kurkela, VTT*
Gasifier technologies, developed with VTT's know-how, were presented: The staged fixed-bed (SXB) gasifier (TLR5) studied in FLEXCHX is designed to a size of up to 50 MWth. The DFB gasifier (TRL5-6) is used at scales of 50 – 150 MWth. This gasifier type is studied in the COMSYN project.

Hot filtration *H. Balzer, GKN*
GKN helped to improve the gas cleaning process within the COMSYN process. GKN has developed a novel production process for a FeCrAlSi-Alloy hot gas filter for the removal of fly ash from the gasifier syngas. With the laser-welded filter candles a stable operation was shown during the COMSYN experiments. Filter clogging was found to occur at high tar content in the raw gas. Long-term tests showed no deposition of corrosive species in the filter material.


FT liquid product and FT wax

Catalytic reforming *B. Rollins, Johnson Matthey*
Johnson Matthey (JM) contributed to the FLEXCHX project with their advances in catalytic tar reforming. Reformation of tars from the gasifier is a crucial process step as the tars lead to fouling in subsequent equipment. Newly developed reformer catalyst types have been tested during the experimental campaigns. Their effectiveness in removing tars from gasifier syngas was demonstrated. The effect of temperature and poisons on the durability of different nickel and platinum group metal catalysts was studied. This allowed Johnson Matthey to prove the viability of tar reforming within the FLEXCHX concept and refine their catalyst cost models.

Sorbent-based final gas clean-up *C. Frilund, VTT*
During the COMSYN and FLEXCHX campaigns at VTT's piloting Centre Bioruukki, a new gas cleaning concept successfully removes gas contaminants according to the requirements of the FT-catalysts. Conventional wet scrubbing solutions are not cost efficient at lower scales. The sorbent based cleaning process under investigation promises a 20% cost reduction compared to the conventional methods. The test runs with woody-residue and agro-residue biomass showed a complete removal of all gas contaminants.

Compact Fischer-Tropsch synthesis *T. Boeltken, INERATEC*
INERATEC offers a solution for the production of renewable fuels and materials with their innovative chemical reactor design. Their


The SXB gasification pilot plant at VTT

micro-structured Fischer-Tropsch reactor matches perfectly with the decentralized production concept pursued in the COMSYN as well as the FLEXCHX project.

Use of FT product at oil refineries *M. Wuokko, NESTE Engineering Solutions & J. Jenčík, ORLEN UniCRE*

NESTE summarizes three co-processing pathways for the Fischer-Tropsch product in existing refining infrastructure in Finland. The addition of a hydroprocessing unit in an oil refinery allows for the production of base oils from the FT wax. Whereas, a hydrocracking unit shifts the product yield towards the shorter chained products gasoline, diesel and jet fuel. A third option is the integration of the distillate fraction to an HVO plant. Thereby, 100 % renewable jet fuel and diesel can be produced.

ORLEN UniCRE has conducted an analysis of the Fischer-Tropsch product from the COMSYN test campaigns. For the analyzed sample the diesel fraction meets the EU standards of a drop-in fuel. Further, it was found that the product can be integrated into the existing refining plant in Litvinov.

Techno-economic study for the COMSYN process *V. Tota, Wood*

With their techno-economic study of the COMSYN process Wood could identify the economically most efficient process configuration. Here, Wood estimates a bio-crude production cost of 1.22 €/l. For the study CAPEX and OPEX are estimated based on a heat-integrated process flowsheet for a 100 MWth plant. Different plant configurations are compared for this study: CO_2 removal in the gas cleaning section doesn't improve the economic outcome compared to a case with no CO_2 removal.

Techno-economic studies for FLEXCHX process *R.-U. Dietrich, DLR*

DLR's applied its standardized methodology for techno-economic and ecological assessment to the FLEXCHX and the COMSYN process concepts. For the FLEXHCX process two operation modes were analyzed, one with electrolyzer, and the other without electrolyzer operation. The winter mode was found to have production costs of 0.7 €/l for Fischer-Tropsch intermediate. With an electricity price lower than 20 €/MWh the summer mode reaches lower production costs than the winter mode.

EU funded FLEXCHX and COMSYN projects organized a webinar on "Compact Gasification and Synthesis for Flexible Production of Transport Fuels and Heat" on 19 January 2021. Detailed webinar presentations are available at the project's websites.

COMSYN PROJECT

COMSYN develops a new BTL production concept by means of a compact gasification and synthesis process. Biofuel production costs will be reduced by up to 35% compared to alternative routes, which translates to less than 0.80 €/l production cost for diesel. The production concept is based on the distributed primary conversion of various kinds of biomass residues to intermediate liquid products at small-to-medium scale units located close to biomass resources. The Fischer-Tropsch products will be upgraded to fuels.

CONSORTIUM: VTT (coordinator), DLR, ORLEN UniCRE, INERATEC, Wood, GKN Sinter Metals Filters GmbH & AFRY.

Website: https://www.comsynproject.eu/

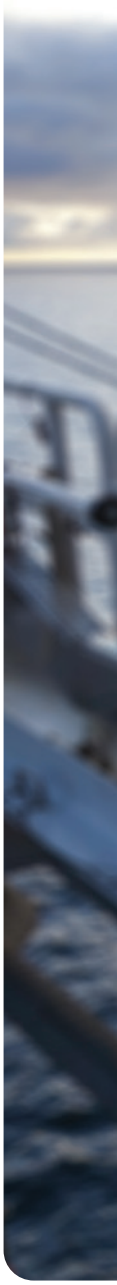
FLEXCHX PROJECT

FLEXCHX-process is a flexible and integrated hybrid process that combines electrolysis of water with gasification of biomass and catalytic liquefaction. The process produces heat, power, and FT-wax, which can be refined to transportation fuels. The vision is to realise a process for optimal use of the seasonal solar energy supply and available biomass resources .

CONSORTIUM: VTT (coordinator), Lithuanian Energy Institute, DLR, Enerstena , Johnson Matthey, Neste Engineering Solution, Kauno Energija, Helen, INERATEC & Grönmark.

Website: http://www.flexchx.eu/index.htm

Projects have received funding from the European Union's Horizon 2020 research and innovation Programme under Grant Agreement No 763919 and No 727476.



Peripheral and Maritime regions: a key piece in the EU Offshore Renewable Energy Strategy puzzle

By Richard Sjölund (pictured below), Vice-President for Climate and Energy, Conference of Peripheral Maritime Regions (CPMR) and Vice-Chair of the Regional Council of Ostrobothnia (Finland).

The EU strategy on offshore renewable energy, published by the European Commission in November 2020, is a much needed and long-awaited step forward to harness the untapped and endless potential of the sea and will be key to empower maritime and peripheral regions in the energy transition.

It is encouraging to see that the EU not only recognises the central role of offshore renewable energy to deliver the ambitious climate and energy targets of the European Green Deal, but also provides now a framework to support the long-term sustainable development of the sector, enhancing the innovation and competitiveness of Europe and its regions.

In order to deliver the objectives of the European Green Deal, the policy solutions and tools implemented will need to be strongly focused on the geographical specificities of the regions, as well as the challenges and strengths of the different European territories. In other words, a place-based approach needs to be applied, enabling tailor-made solutions that leverage on the regions' endogenous resources. For instance, south-westerly winds in the Gulf of Bothnia create excellent conditions for wind-power, while pilot projects in the Gulf of Biscay are showing how the area has a strong potential in harnessing the power of the waves.

Within the CPMR – representing 150 peripheral and maritime regions in Europe – we are fully in favour of a sea basin approach, and the strategy rightly points in this direction by steering differentiated policy solutions and technologies for each sea basin and within sea basins, underlining their own specificities and potential. We should also not forget the key role that islands and outermost regions have as innovation laboratories. A sea basin approach will be fundamental to foster the uptake of offshore renewables in all the sea basins and promote territorial cohesion.

Today, more than ever, we need to ensure that no one is left behind, and the scale-up of offshore renewables and its related value chain can provide for a just transition and economic recovery benefitting not only coastal regions but also inland and land-locked ones.

Supporting and valorising existing industrial energy clusters as well as the know-how and expertise of the traditional maritime sector will be key in the green transition, as much as building strong synergies with the blue industry value chain and tackling the current skills challenges of the sector. Regions have a crucial role to play in this respect, and many successful projects and initiatives are already being implemented. Now is the moment to scale-up and reply to the call of the EU strategy to make offshore renewable energy a core component of Europe's energy system by 2050.

But even if an untapped potential is present in every sea basin surrounding Europe's territories and outermost regions, the budgetary challenge for the European Union is non negligible. A strong European budget is pivotal for achieving the ecological transition, as private capital will by no means be sufficient, especially for the less mature technologies. For instance, massive investments (€800 billion) will be needed to reach the strategy's targets of 300GW offshore wind and 60GW ocean energy installation

capacity by 2050. The European Commission will mobilise diverse EU funds and instruments to promote the deployment of large-scale projects and to fund research, innovation, and demonstration projects (including InvestEU, the Connecting Europe Facility and Horizon Europe). At the same time, it will encourage the use of Cohesion Policy funds for investments aimed at ensuring social and economic cohesion.

In the context of the COVID-19 recovery, the National Recovery and Resilience Plans developed by Member States within the Recovery and Resilience Facility, will also play a key role in the deployment of offshore renewables. However, some concerns arise as the Recovery Plans are to be consistent with the priorities identified in each Member State Integrated National Energy and Climate Plans (NECPs) which identify policies and measures to reach the 2030 climate and energy targets. Little to no measures are found in most NECPs for the development and deployment of ocean energy, which casts some doubts on the short and medium-term ability of the Member States to commit to a ramp-up of offshore renewables.

The involvement of regional and local authorities, industry, and civil society to identify challenges and solutions will be crucial for delivering the EU strategy on offshore renewable energy and the European Green Deal. The inclusion of regional authorities in the Clean Energy Industrial Forum and the creation of a specific working group on offshore renewables is a step in the right direction. However, a concrete involvement of territorial authorities and partnership with local and regional stakeholders since the early stages of planning and development will be essential. The CPMR will continue calling for such involvement at European level.

Establishing a robust and efficient multi-level governance would ensure a place-based approach, increase the sense of ownership of European policies for regional and local communities and reply to the urgency felt for a green transition and recovery at a territorial level. The peripheral and maritime regions are ready to contribute with their expertise and know-how to deliver a competitive, resilient and climate neutral Europe.

POSEIDON MED II LNG BUNKERING PROJECT
sailing on the LNG era

Poseidon Med II establishes a sustainable and efficient LNG supply chain for marine transportation in the Eastern Mediterranean

Poseidon Med II is a key European project co-funded through the Connecting Europe Facility (CEF) aiming to accelerate the adoption of LNG (liquefied natural gas) in the Eastern Mediterranean marine transportation. Poseidon Med II encompasses all the technical, regulatory, operational, and financial parameters to establish a viable, efficient, and sustainable supply chain in the region, unlocking the necessary investments for the establishment of the small scale LNG (ssLNG) infrastructure in the area.

Under increased pressure to follow a greener "pathway" towards a decarbonized future, the shipping industry needs to turn climate change targets into tangible action. LNG as a marine fuel can reduce GHG emissions, thus improving air quality at ports, while paving the way to carbon neutral shipping with the use of liquefied biomethane (LBM) and liquefied synthetic methane (LSM).

The increasing numbers of LNG – fuelled vessels and LNG bunkering vessels (the latter expected to rise from the seven operating in the EU to almost fifteen vessels by the end of 2021), testify to the growing recognition of the environmental benefits of LNG as a marine fuel. These investments along with the expansion of shoreside LNG infrastructure, provide the critical last-mile delivery of LNG to ships.

In 2020 the Greek Ministry of Maritime Affairs gave the "Port of Piraeus" the "green" light to start, in specific locations inside the port area, LNG bunkering operations, either from ship-to-ship or truck-to-ship, whenever the necessary investments are in place.

Given the key role of the Revithoussa LNG Terminal as the "logistical springboard" of the ssLNG supply chain in the wider region, investments for small scale facilities in the terminal are underway. A truck loading station, for bunkering and off grid consumers' supply, is currently under construction and will be operational by Dec 2021. Moreover, the basic engineering design of a new ssLNG jetty has been completed. The facility will accommodate vessels from 1.000m^3 to 20.000m^3 and is expected to be operational by Sep 2022.

With regard to ports, the respective master plans for LNG bunkering facilities for Piraeus, Patras, Heraklion, Igoumenitsa and Limassol are completed, the mandatory environmental studies are being finalized and Cost Benefit Analyses have already been carried out. To maximize the opportunities created by these actions, an LNG bunkering vessel, registered at the Piraeus Port, loading LNG from the nearby Revithoussa Terminal, will be operational by 2022.

In Cyprus, PMII is financing the studies for the construction of a permanent berth for the docking of LNG bunkering vessels, opposite to the jetty for the FSRU berthing in Vassilikos area.

Furthermore, encouraging the shipping world's efforts to meet the challenging IMO and EU environmental driven targets and to lead by example, PMII is supporting the design studies regarding the retrofitting of ten conventional fuelled vessels to run on LNG. Additionally Cost Benefit Analyses have been performed for all Ports and the ten selected vessels.

At the same time, the construction of an innovative Semi Ballastable Barge Transporter (SBBT) has been launched in Italy (scheduled for delivery in 2021), which will operate in the Mediterranean and the Adriatic Sea.

On the regulatory framework, the "umbrella" legislation ensuring safe LNG bunkering operations at Greek Ports was completed and published already in 2019 in the Government Gazette (Presidential Decree 64/2019). Additionally, PMII has drafted a Practical Guide to Port Authorities on how to maintain safety during LNG bunkering operations.

In order to establish an economically viable supply chain, PMII has financed a series of studies assessing the cost of LNG bunkering logistics and synergies with other sectors, such as supply with natural gas the industrial and/or the urban network of Western Greece (Patras & Igoumenitsa) and Vassilikos (Cyprus).

Poseidon Med II, has already laid the foundations for LNG bunkering in Eastern Mediterranean, setting the example for a cleaner, more effective, competitive and sustainable marine transportation towards a zero-carbon future. With Poseidon Med II Eastern Mediterranean is sailing into the LNG era.

poseidonmedii.eu

Co-financed by the Connecting Europe Facility of the European Union

A microbial miracle: desalination without electricity

In the attempt to overcome water scarcity, desalination with reverse osmosis (RO) has been a growing trend, with recent projects in the Middle East reaching a capacity of 1,000,000 m3/d per plant. But with an electricity consumption around 4kwh/m^3, such plants need specific power stations dedicated only to run the high pressure pumps.

The EU-funded MIDES project addressed this challenge by developing and operating the world's first industrial demonstrator of a revolutionary technology based on microbial desalination cells (MDCs). It uses MDCs as a pretreatment for RO, enabling salt separation and water treatment to be conducted simultaneously.

MDCs employ specific bioelectroactive bacteria, called Geobacter to transform the energy contained in the organic matter present in wastewater into electrical energy. The potential difference created between the electrodes causes the separation of salts through the ionic exchange membranes, allowing to desalinate seawater and brackish water without external energy. The electricity needs are thus reduced by 92.3% compared to conventional processes for wastewater treatment (activated sludge) and desalination (RO).

From lab to pilot plant

Starting in 2016, at laboratories of IMDEA Water (Madrid, Spain), project partners overcame the current limitations of MDC technology such as low desalination rate, high manufacturing cost, and biofouling and scaling problems on membranes, and optimised the microbial electrochemical process. This was achieved through an exhaustive scaling up process involving novel anti-fouling ion exchange membranes and new carbon-based electrodes.

Researchers employed a circular economy approach in the MDCs using recycled plastics to configure the cells and stack. They also designed mathematical simulation models based on experimental results from the lab-scale, pre-pilot and pilot-scale stages of the project to optimise the process. In addition, new operational parameters and membrane cleaning protocols were implemented to enhance the bioelectrical reactions. The technology was patented by Aqualia and IMDEA Water (Ref. EP 3336064 A1).

Following successful scaling up, MIDES designed and built two MDC prototypes, each comprising one stack of 15MDC units with a total area of 0.4m^2 per unit. Both prototypes can process thousands of litres brackish water and seawater per day with very low energy consumption.

The first MIDES pilot plant at Denia in Spain involved brackish water and wastewater pretreatment, the MDCs and low-pressure RO followed by postreatment to guarantee drinking water quality. The second site on the Spanish island of Tenerife used MDCs to carry out partial desalination of seawater and RO for subsequent post treatment to obtain drinking water from seawater without the use of external energy.

Benefits for rural and urban communities

By developing a combined water desalination and wastewater treatment system, MIDES can facilitate low-cost access to sanitation and safe drinking water according to national and EU regulations. It can also provide treated wastewater for reuse in irrigation and agricultural applications, thereby relieving pressure on current resources.

MIDES paves the way for smaller capacity decentralised plants, which purify wastewater with a positive energy balance. This means that with the help of MDCs, this technology can be implemented at remote industrial sites, farms and rural communities with limited power supply.

Furthermore, MIDES can benefit coastal sites by equipping them with comprehensive wastewater treatment plants that power water desalination facilities within intelligent management and control systems.

Outside view of the ceramic membrane pilot plant container

Coordinated by: Aqualia (Spain)

Funded under: H2020-EU.2.1.2.

CORDIS factsheet

Project website:
http://midesh2020.eu

Video:
https://youtu.be/sQbVm8IXNto

Keywords:
MIDES, MDC, desalination, wastewater, RO, microbial desalination cell, reverse osmosis, Geobacter wastewater

Ocean energy: Opening up the path to 100MW by 2025

By Ocean Energy Europe

Installing and operating machines in the open sea is not for the faint-of-heart. Doing so during an unprecedented global pandemic is a major achievement. For the ocean energy sector, 2020 proved to be a year in which the more familiar challenges of finding weather windows and available vessels were replaced by the unfamiliar: sudden lockdowns, travel restrictions and quarantine.

And yet, in a tough year, ocean energy developers around the world showed their commitment to the technology. Several ocean energy devices made it into the water, from the chill Atlantic to the subtropical East China Sea. New industrial facilities opened their doors, investors dug deep to fund many exciting projects, and new EU and national targets helped to plot the course of ocean energy's industrialisation.

Cumulative capacity additions worldwide now stand at almost 60 MW for tidal stream and wave energy, and two-thirds of that figure was installed in Europe, according to recently published statistics. In December, the European tidal sector reached the milestone of 60 GWh of cumulative electricity production, in spite of restrictions on project logistics and personnel.

And even in a shaky financial climate, investment continued to flow in. On top of EU funding, which continues to be a key factor in the sector's progress, project developers in Europe attracted at least €45 million of investment from private and public sources. Another €4 million came from individuals via crowdfunding schemes – an overwhelming vote of public confidence in these innovative technologies.

Europe's new targets need national actions

The big European policy moment of 2020 was the publication of the European Offshore Renewable Energy Strategy and its targets to deploy at least 100MW of ocean energy by 2025, 1GW by 2030 and 40GW by 2050. These goals, together with the other actions of the Strategy, are an important recognition of the contribution ocean energy can make – though they could be even more ambitious!

The biggest stumbling block for ocean energy remains the lack of revenue support at the national level. Member states must ensure that political buy-in translates into tangible support to get projects off the ground. The past few years have shown us that support mechanisms such as feed-in tariffs are decisive factors in creating a market for ocean energy.

Canada is perhaps the best illustration of this, with its robust support of ocean energy projects. Notably, it is offering a 15-year guaranteed Feed-In Tariff for tidal power in Nova Scotia, which has attracted European developers Sustainable Marine, DP Energy and Nova Innovation. The former deployed the first of its three devices at the start of 2021, the first phase of a much bigger 9MW project.

Europe's governments must draw the obvious lesson from this. The pipeline of ocean energy projects is ready to go. Just as long-term feed-in tariffs kick-started the European offshore wind sector in the early 2000s, subsidised electricity prices will leverage private investment, and produce the cost reductions that both investors and policymakers want to see.

2020 project successes set the stage for 2021

The latest trend in the sector, as it gears up for industrialisation, is the shift towards multi-device projects. Many of the installations completed in 2020 were merely the first in a series of devices, destined to become pilot farms.

Larger projects mean lower costs, as economies-of-scale and accelerated learning lead to cheaper manufacturing, installation and maintenance.

Minesto, who hail from Sweden, signed a 2.2MW Power Purchase

Agreement (PPA) with the Faroe Islands' utility for a tidal power plant last spring. By October, the first of their innovative kites was in the water, with another one set to join it this year – the first step in a large-scale project that will see tidal energy become a core power source for the islands.

In 2020, Nova Innovation added a new tidal turbine – named 'Eunice' – to the Shetland Array in Scotland. Two more turbines are set to join her on the seabed in the next two years, bringing the number of devices at the site to six. Funded in part by the EU's Horizon 2020 programme, the farm has been powering homes and businesses in the local area for five years.

Another Scottish tidal energy outfit, SIMEC Atlantis Energy, saw its 500 kW turbines installed in the Chinese Zhoushan archipelago last spring, and in Japan's Naru Strait at the start of 2021. But Asia is only half the story: the developer has big projects underway in Europe, namely the flagship Meygen farm in Scotland and the newly secured French Raz Blanchard site.

It is also a partner in the biggest ever INTERREG project – the multi-technology TIGER project, which is demonstrating a range of devices in the English-French Channel until 2023.

Danish wave energy developer Wavepiston installed the first phase of its demonstration project in Spain's Canary Islands. The next stage, which includes an additional desalination element, is set for deployment in 2021.

They are in good company – a host of other wave developers will also deploy new devices this year – among them Corpower, Bombora, Columbia Power Technologies, Resen Wave and MOCEAN.

Value above and beyond blue electricity

It's easy to count success in terms of deployments and financing, but behind every device in the water, there is a whole 'village' of workers, vessels and infrastructure that make it happen.

As a CAPEX-intensive industry, ocean energy creates skilled jobs, builds new facilities for manufacturing and operations, and repurposes existing maritime infrastructure in coastal areas. By 2050, the sector could employ 400,000 people in Europe. It is also the catalyst for new research opportunities, opening up new fields of study and expertise.

In October, Minesto opened its new assembly hall in Holyhead, Wales, which acts as the hub for its tidal projects in Europe. Not only does the new plant bring new jobs to the local area, but it streamlines the developer's construction and maintenance activities, and enhances the reliability of the technology.

Another important facility, this time for wave energy, is located in Northern Portugal. Corpower, another Swedish company, recently secured a €7.3 million investment from EU and Portuguese agencies to advance its research, manufacturing and service centre. This centre will bring long-term employment to the region, in the supply and service of future commercial wave energy farms.

Finally, Italian power producer ENI opened a new joint research laboratory with the Politecnico di Torino last year. The Marine Offshore Renewable Energy Lab (MORE) reflects Italy's growing interest in ocean energy technologies, and will help drive forward the state-of-the-art for the entire sector.

2020 has shown us that the ocean energy sector is resilient in the face of shocks and slowdowns. Although some projects faced delays, none were cancelled, and the industry continued to make huge strides in its quest for industrialisation. 2021 has already seen two more devices hit the water, with many more queued up for deployment. With the right market conditions, the first of the EU's targets is well within reach. ●

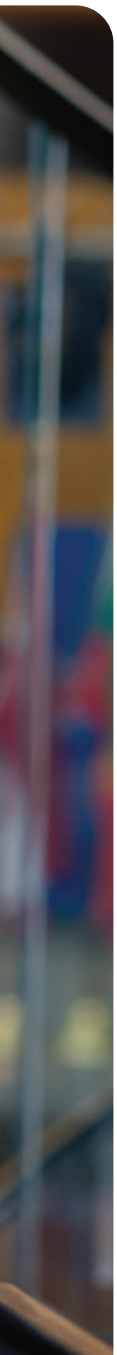
Solid Biomass - a Renewable solution to rural household heating

By Sean Kelly, MEP (pictured)

The future of the European economy, and indeed the collective welfare of our citizens, requires a comprehensive response to the climate crisis and a transition to a low carbon economy.

The task is clear, but the solutions to a multifaceted, cross cutting and geographically specific problem requires the need to consider the full range of low carbon technologies, their associated performance, cost and environmental benefits. Eco-innovation and awareness of climate change has brought about a cultural shift in Europe. Yet, what is clear is that if we fail to ensure fairness and inclusivity in our transition, not only will we not meet our climate targets, but risk exasperating inequality and create divisions that could threaten the very structures of the Union itself.

When we speak about emissions reduction, we often think about



agriculture, the energy sector and transport. Yet heating represents around half of Europe's final energy consumption with the vast majority of homes still using fossil fuels, i.e. oil, gas, and coal. In fact, the main use of energy by households is for heating their homes, accounting for 63.6 % of final energy consumption in the residential sector.

There is a range of new and innovative ways to reduce our emissions, and to achieve a more just transition we must remember that there is no,"one size fits all," solution. Meaning that we need to take into account the specific conditions facing local communities and individual households, and that includes energy sources. In rural communities for example, we need to support a range of low carbon heating technologies beyond just heat pumps.

There has been a lot of focus placed on energy efficiency of homes, and rightly so. But the other side of the coin to reducing our carbon footprint is by switching to renewable energy, yes wind and solar technologies, but also bioenergy, such as solid biomass or liquid biofuels.

There is no doubt that heat pumps will be a key technology, particularly for new builds. However, for some households installation will require a major heating system change, which could prove to be both expensive and disruptive, and just may not be possible for some people.

The "just" in just transition means that we have to bring everyone along, and for some rural areas and households, the best avenue for decarbonisation comes in the form of biomass - fuel made up of plant-based organisms and typically comes in the form of wood chips, logs and pellets. The real trick with biomass boilers is that they operate more like conventional oil and gas boilers as they burn fuel but with vastly less, and cleaner, emissions.

When switching your home to biomass you will need a direct replacement of the boiler, but there likely would not need to be any further works needed for the internal pipe and radiator systems. Not only is switching to Biomass less disruption, with significantly lower upfront costs to that of heat pumps, but wood pellets are readily available and economically affordable solutions to phase out fossil fuels.

Decarbonisation is the goal here, and when considering a home's characteristics, its location and available technologies - biomass can be a very good option. Now, I am not saying it is the right solution for every household, but particularly, for rural areas, it offers some attractive possibilities in emissions reduction that are coupled with the added bonus of lower running energy costs. It essence it is a renewable solution to household heating in rural areas that are not on the gas grid and would otherwise use oil or even kerosene.

We must not also neglect the positives to rural air quality, which receives far less recognition than urban areas, and often falls under the common misconception that it is free from pollution.

The utilisation of bioenergy more broadly can have a direct beneficial impact on the local economy, with the likes of Anaerobic Digestion, that can create a stable revenue stream for anyone supplying feedstock as well as providing a benefit to the local community and stimulating agriculture. Wood pellets too, with sufficient demand, sawmills can utilize excess wood for pellet production, in turn creating additional jobs and stimulating value-added economic activity for the region.

This is not say that the likes of biomass boilers do not have their limitations, they do. They require larger space than gas or oil boilers as well as room for the pellet storage. However, for small-scale projects, they really provide a credible option to decarbonise, and that is why we should continue to provide incentives for the effective usage of biomass to allow consumers overcome initial capital investment and facilitation of local supply chains to meet demand. In essence, households can use locally sourced fuel instead of imported gas or oil that will increase the security of their energy supply as well as cutting costs.

The cost of heating homes has become a heavier burden for many households. Even before the pandemic hit, over 30 million Europeans struggled to pay their energy bills. There needs to be support given to those individuals to ensure they are not left behind, and this comes in numerous different ways at EU, national and local level.

Building renovations in the broader scheme will be crucial if we are to meet our goal of climate neutrality by 2050, but we must ensure that as policymakers we provide a framework that is flexible enough to cater for the most efficient technologies and systems that take into account local and regional characteristics.

For many, solid Biomass will be the best option, and we should encourage its use when it is.

Seán Kelly MEP has been an MEP for Ireland South since 2009 and is the leader of the Fine Gael delegation in the European Parliament. A member of the European Parliament's Industry, Research and Energy Committee, Kelly has worked extensively on renewable energy and energy efficiency policy.

First Dall Energy plant in France built on time

In the Autumn 2019 issue of European Energy Innovation we presented the Dall Energy technology and their first order in France – a 20 MW Furnace for Dalkia.

In this issue we focus on how the project has progressed and look at the initial results.

The Dall Furnace has disrupted biomass combustion technology and the design has managed to include several advantages

- Reduction of dust and particle emissions by more than 90% and NOx by 30%.
- Lower maintenance costs (no technical difficulties, low power consumption)
- Very wide load window (fast and easy modulation between 10 and
- 100% load without problems)
- Reduction of fuel cost as the technology is very fuel flexible.

Dalkia – a subsidiary of EDF, the main electricity company in France – started to work on the Dall Energy Furnace technology in 2015.

After several meetings between Dalkia and Dall Energy and a test of French fuel, Dalkia decided in 2018 to purchase a first Gasifier unit from Dall Energy for the city of Rouen in France.

The plant will supply up to 17 MW of heat for the network and run for more than 7 000 operation hours per year. A seemingly straightforward demand, however, the constraint is that the district heat network has no buffer tanks for hot water storage. Thus the new heat plant needs to be able to respond and adjust accordingly to fluctuating daily heat demands on the network.

Dall Energy site manager Jes Siegrist, at the startup burner.

Support from Horizon 2020

Dall Energy have received funding from the European Union's

Horizon 2020 Research and Innovation Programme under Grant Agreement no. 811529, to upscale and demonstrate their technology.

Constructed on Time – despite of COVID-19

In March 2020 all of Europe was hit by COVID-19 and it affected this project:

The site in Rouen was closed on the same week as Dall Energy was supposed to deliver and install both the Furnace and Boiler.

Dalkia and Dall Energy agreed to store the equipment at the sub suppliers. In June the site was reopened, and a new timeline was agreed upon.

The timeline was very ambitious: despite the COVID-19 situation, the plant should still be commissioned in 2020.

In many ways it has been an incredibly challenging project, but we succeeded, due to a very good collaboration. The plant started up at the beginning of December. The initial results are promising. The inauguration will take place on December 10 in the presence of the CEO of Dalkia and the Danish Ambassador.

The final commissioning will take place at the beginning of 2021.

A super performance Dew Point cooler for data centres

The UK Data Centres (DCs) have an estimated overall power capacity of 4.5GW and average Power Usage Effectiveness (PUE) of 2.5. Out of the total energy delivered to the UK DCs, 30% - 40% is used for space cooling to remove a tremendous amount of heat dissipated from the IT equipment. The traditional cooling equipment for DCs is based on the mechanical vapour compression principle with Coefficient of Performance (COP) of 2 to 3, leading to the energy-intensive operation. Several alternative cooling technologies have been introduced but they are all inapplicable to DCs.


20kW unit in construction/testing process

With over 15-years' continuous endeavour, the applicants at the University of Hull (UHULL) have developed a super performance dew point cooler (with COP of 52.5) which can lead to 50%-90% reduction in electricity consumption and carbon emission compared to traditional systems. To-date, this technology has won two internaitonal innovation awards, i.e, World Society sustainable energy technologies 3rd round innovation award, and 2018 UK Rushlight Innovation Award.

The proposed project aims to construct the aforementioned technology in order to demonstrate it in a data centre in Hull City. This project is led by University of Hull along with NPS Humber Ltd (NPS) and Environmental Process Systems (EPS). The combined effort of the partners will bring this technology from the current status of TRL6 (validated in laboratory and industrial workshop) to TRL8 (demonstration of the technology in a live Data Centre environment). This will result in bringingthe innovative dew point cooling technology into real world business, which will open up an enormous Data Centres cooling market.

The overall aim of the project is to construct a specialist Data Centre dew point cooler and demonstrate it in Hull City. This will lead to smooth transition of the laboratory-validated and award-winning technology into a commerical product. The specific objectives of the project are: (1) Data Centre survey; (2) prototype design and optimisation; (3) prototype construction; (4) site installation and field testing, and (5) data collection, demonstration and exploitation. Although this technology has been laboratory approved with the claimed energy saving and carbon reduction rate, no evidences have yet been establsihed with its fittability and reliability for the use in Data Centres. This project fills the aforementioned gaps by demonstrating and qualifying the specialist dew point coolers in a live Data Centre environment. Furthermore, it will contribute to mitigating the risks of the manufacturer and Data Centre operater on R&D investment, and also, brings together the experts from the university, manufacturer and Data Centre operator to complete the technology transfer and engineering applications.

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Energy intensive industry decarbonisation

By Sander de Bruyn (pictured), PhD, Principal Economist, CE Delft

Energy intensive industries in the EU face a special challenge in the transition towards a carbon neutral economy. Their present carbon footprints are substantial and reductions are being perceived as complicated and costly. As many energy intensive industries compete on world markets., cost competitiveness is considered as a crucial element for their future. One of the key questions is therefore how energy intensive industries can remain competitive while lowering their carbon footprints. A recently published study by CE Delft and Ecologic for the European Parliament tries to formulate some answers.

1. Traditional climate policies are not sustainable in the long run

So far, climate change policies in the EU and their Member States have sought to minimize adverse impacts on cost competitiveness for energy intensive industries (EII). In the EU Emission Trading Scheme, EII receive the largest part of their allowances at no charge. Moreover, several energy intensive industries, such as basic metals and minerals, are exempt from paying energy taxes in most member states. The prime reason for such preferential treatment is the firm belief that by lowering climate policy costs for industry, harm to competitiveness can be minimized. However, this policy has come at a cost: so far EIIs have not decreased their CO_2 emissions between 2009 and 2018 and energy productivity gains have been disappointing. This makes European industries vulnerable for future climate policies with associated increases in carbon costs.

In the next decade it is expected that more and more countries will introduce carbon pricing or other, comparable climate policies. Competitiveness in a decarbonising global economy will then primarily be determined by the capacity to deliver products with drastically reduced carbon footprints. Shielding EIIs from higher carbon costs may therefore only be a short-term fix leading them into a lock-in. A more long-term oriented policy framework should build up or extend leadership in the area of the deployment of low-carbon industrial technologies.

2. Technology is not the bottleneck

Traditionally an argument to safeguard industry against climate policy costs is that the technologies to guide industry towards carbon neutrality by 2050 are not yet market ready. However, in the last 10 years, substantial progress has been made in exploring and developing technologies that deliver carbon neutrality by 2050. There are plenty of technologies available that can potentially guide Europe's energy-intensive industries towards carbon neutrality in 2050. There are many techniques that can reduce process emissions (e.g. energy efficiency and carbon capture and storage), techniques that replace fossil fuels as an energy carrier (e.g. electrification and hydrogen) or feedstock (e.g. hydrogen and biomass) and techniques that develop new production pathways with a lower CO_2 footprints: (e.g. circular economy and carbon capture and utilisation). In the iron and steel sector, CO_2 emissions from burning fossil fuels can be reduced by new processes or by using carbon capture and storage. In the fertilizer sector, feedstocks can be replaced by hydrogen produced from renewable energy. Low temperature heat in industry can be decarbonised through heat pumps and geothermal heat. Emissions that cannot be avoided could still be tackled through carbon capture.

The major hurdle for these technologies is currently related to costs. Both high upfront capital costs and higher operational costs provide an effective barrier towards uptake of these technologies. However, this argument should not be exaggerated. Although most technologies provide carbon-neutral energy at a cost factor change 2 to 3 times higher than from fossil fuels, the total product price increases tend to be modest. As energy is only one of the cost components, total cost price increases are predicted to be below 10% for most of the products from the energy intensive industries if direct energy costs would double.

3. Creating market demand is key

Subsidies are often believed as

effective carbon market instruments for energy intensive industries competing on world markets. While subsidies can be helpful to accelerate change, in the long run Europe cannot subsidise its industry all the way into carbon neutrality: the transition must be driven by market-based incentives. Our report identifies that a redesign of fossil fuel-based products (such as bio-based plastics, synthetic fuels and recycled cement) is important in the transition towards a low carbon economy. Demand for such carbon neutral products can be encouraged through green public procurement and product regulations. The push for a circular economy could be another enabler in stimulating market demand.

Carbon prices also have to play a role here: without substantially higher carbon prices, a business case for low carbon technologies and products may not be there and "stranded" assets in the fossil fuel industries retain their value, effectively blocking a shift of investments towards low carbon technologies. Carbon prices should increase significantly in order to make EU industry in line with a 2-degrees pathway scenario: near € 100/tCO_2 in the short to medium term, to over € 250/tCO_2 in 2050. If implemented unilaterally, higher carbon prices come at the cost of deteriorating competitiveness, so they would need to be accompanied by an effective carbon border mechanism. The most effective carbon taxes would be based on the factual CO_2 embodied in products. Consumption based charges, if well designed, would force consumers to take carbon costs into account, stimulating low-carbon alternatives. Embodied carbon can be administered in a system similar to the VAT where in every production step the added carbon is being administered. Such administration can assist in the development of green procurement or can form the basis of Carbon Added Taxes (CAT) as an alternative to the current VAT. Such initiatives automatically implement carbon border mechanisms as consumption-based taxes imply that the origin of the product is irrelevant for the level of taxation.

4. Green recovery schemes can act as a flywheel to invest in necessary infrastructure

Many of the technologies to make industry carbon neutral require substantial investments in infrastructure: grid reinforcement of electricity networks, CO_2 pipelines and green hydrogen networks as well as plenty of renewable energy available. Individual companies may not be able to realise efficient networks and governments have to step in to invest in these networks. Users of these networks must be charged a fair price that can support a positive business case for investment in carbon-neutral technologies. Regions with the right low carbon infrastructure may gain a comparative advantage when it comes to energy intensive industries.

Over the coming months, governments across Europe are expected to launch stimulus packages to revive their economy and to restart economic development and growth. This presents a unique opportunity to accelerate investments needed for the transition of energy-intensive industries towards carbon neutrality. Investments in low carbon infrastructure should be on the agenda in order to create the right enabling framework for companies to invest in low carbon technologies ●

Link to study:
https://ce.nl/en/publications/2475/energy-intensive-industries-challenges-and-opportunities-in-the-energy-transition

GeoHex – Developing high performance heat exchangers for geothermal applications

By GeoHex consortium

The provision of clean and affordable energy is one of the biggest challenges of our time, and all clean energy sources are expected to play a role in delivering sustainable energy targets. Geothermal energy is particularly important as it is also a flexible form of energy that can supply power uninterrupted by weather and therefore can help to stabilise the power grid with increasing penetration of solar and wind. Despite this, geothermal is not currently on target to reach the IEA sustainable development scenario, which requires a 10% annual increase between 2019-2030, with generation increasing by 3% in 2019. A key driver to increase the utilisation of geothermal power is the reduction of costs associated with power generation, both for flash plants as well as for Organic Rankine Cycles (ORC), which can utilise lower temperature resources. The utilisation of lower temperature resources is particularly critical as they are more prevalent, allowing the expansion of geothermal into different geographic locations. Factors affecting the high cost of geothermal plant include:

- **Low efficiency:** A major issue in geothermal plants is mineral, particularly silica, scale build-up which can occur as the hot water/wet steam can be supersaturated in these minerals at certain temperatures, relevant to the thermal cycle. This must be mitigated by operating at inefficient temperatures, through chemical inhibitors or through frequent downtime and cleaning.

- **Corrosion:** Geothermal fluids are aggressive and therefore there is a requirement to utilise stainless steels or other corrosion resistant alloys in geothermal plants. These materials are also more expensive then lower alloyed steels.

The aim of the GeoHex project is to address both of these factors for the case of geothermal heat exchangers in ORC plants, where heat exchangers can account for a significant proportion of the capital costs, upto 86%. In particular, GeoHex will aim to develop coated heat exchanger tubes and plates to avoid scaling and increase efficiency, whilst also enhancing corrosion resistance so that lower cost materials can be utilised, i.e. low alloy steels instead of stainless steels. Anti-scaling and corrosion coatings will be focussed on Ni-P/Ni-P-PTFE duplex coatings and amorphous coatings, which have enhanced corrosion resistance as they do not possess grain boundaries which often degrade corrosion performance. In addition to coatings focused on the brine/hot water side of the heat exchanger, we will also consider coatings for the working fluid side, intended to enhance heat transfer performance.

The project was Launched in November 2019 and is a three year

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 851917.

initiative involving 13 partners from across the globe: TWI (UK), ON power (Iceland), ENOGIA (France), Grein Research (Iceland), Technovative Solutions (UK), FlowPhys AS (Norway), Spike Renewables S.r.l (Italy), CEA (France), Innovation Centre Iceland (ICI), University of Bucharest (Romaina), University of Leicester (UK), University of Iceland (Iceland) and Quantum Leap JMB(the Philippines). It is also the first RTD project for the Philippines that highlights transcontinental technology transfer for development of advanced materials for cost-efficient and enhanced heat exchanger performance in geothermal applications.

Despite most of the project being undertaken in a state of lockdown, we have made good progress developing coatings that have characteristics that are state of the art, for example in terms of hydrophobicity, whilst also displaying excellent adhesion. The remainder of the project will focus on determining the heat transfer characteristics of the coatings before testing in full scale heat exchangers.

GEOHEX

Geo-Coat: Mitigating Material Challenges in Geothermal energy production

Can coatings help mitigate the material challenges in geothermal energy productions? As part of the project Geo-Coat (funded by European Union's Horizon, Grant agreement 764086), novel corrosion- and erosion- resistant coatings based on selected High Entropy Alloys (HEAs) and Ceramic/Metal mixtures (Cermets) have been developed, showing remarkable resistance to threats of geothermal operations. These coatings can be applied through standard coating techniques (primarily High Velocity Oxygen-Fuel and Laser cladding) and have been designed to provide the required bond strength, hardness and density for challenging geothermal applications.

This event will present an overview of the Geo-Coat methodology to address the material challenges, exciting results from in-situ durability testing of the coatings in real geothermal environments, demonstration of flow assurance simulation models, demonstration of economic impact of Geo-Coat through Levelized Cost of Energy (LCOE) results and benefits of using coatings as lessons learned by end user.

Program:

- The Geo-Coat project
- In-situ durability testing of Geo-Coat developed coatings
- Geo-Coat Geothermal Flow Assurance Simulator
- The environmental footprint results with and without Geo-Coat technology components adopted in an Icelandic double flash type geothermal power plant
- Economic impact of Geo-Coat in highly corrosive geothermal environment
- Benefits of using coatings in geothermal power plants from an end-user perspective: lessons learned

Registration: https://www.geo-coat.eu/news/2021/in-situ-durability-testing-of-geo-coat-developed-coatings#

The Geo-Coat project has received funding from the European Union's Horizon 2020 research and innovation programme. Grant agreement 764086.

https://www.geohexproject.eu

Birmingham and Oldham use data to decarbonise the building sector

By Priscilla Castro, Officer, Communications and Member Relations, ICLEI

Energy efficiency in the building sector is key to achieving the goal of making Europe the world's first climate-neutral continent by 2050. Representing 40 percent of the total energy consumption in the European Union and 36 percent of its greenhouse gas emissions, public and private buildings must take centre stage in the decarbonisation efforts.

As part of the work to decarbonise cities, including increasing energy efficiency in buildings, ICLEI Local Governments for Sustainability and Google.org are financing data-driven projects in cities across Europe to significantly reduce GHG emissions in the next few years. Through the ICLEI Action Fund, two organisations – one in Oldham and one in Birmingham – will receive almost €700,000 to invest in decarbonisation actions.

Running since November 2020, the project "3D - Data to help Decarbonise in a Decade", organised by the Centre for Sustainable Energy (CSE), will establish a city-wide energy data hub to assist Birmingham in its goal to decarbonise by 2030. The Project aims to aggregate address-level and local-area energy data for the city's residential, non-domestic buildings, existing and planned energy infrastructure, combined with socio-economic and demographic household data. Building energy data will inform low-carbon policies, while housing energy datasets, housing tenure and sociodemographic will support targeted home energy efficiency programmes.

In an effort to identify data-driven good practices, gain a better understanding of the community and stakeholders, and raise awareness, 3D will also offer training to inform city-scale activities (e.g. local planning policies, communications campaigns) and run an open grant scheme for community organisations to carry out carbon reduction activities – 10 grants of £10,000 for small area initiatives, such as building energy efficiency upgrades and new renewable energy solutions.

While in Oldham, Carbon Co-op will receive funding to create new Energy Masterplans for neighbourhoods and to run three pilot citizen-led sustainability projects. Aggregating diverse, open datasets, the project will initiate a neighbourhood scale 'Think and Do tank' to co-produce the Masterplans.

The process will be supported by an Urban Energy Dashboard, using data streams to baseline and track progress on sustainable energy.

Photo: Georgi Kyurpanov – Unsplash

Photo: Tom Podmore – Unsplash

The pilot locations will be defined assessing the area's potential for wind or solar energy generation and locally available funding schemes. In the end, data will be made available to citizens for direct access.

Renovation is key to decarbonisation

Project 3D and the Urban Energy masterplanning aim to support Birmingham and Oldham in achieving their climate mitigation targets, in turn contributing to European goals. In order to reach the EU's decarbonisation goals, the European Commission estimates that greenhouse gas emissions attributed to buildings must be reduced by 60%, final energy consumption by 14% and energy consumption for heating and cooling by 18%.

Considering that more than half of Europe's current building stock will still be here in the next 30 years, policy responses must not only focus on the energy performance of new construction, but also on renovation schemes for existing ones. The Renovation Wave Strategy, announced by the European Commission in October 2020, aims to double renovation rates in the next ten years to reduce the energy demand.

Renovation does not only bring environmental benefits, but there are also clear economic advantages. At the household level, energy efficiency leads to savings on water, electricity, and heating bills. Such economic benefits also enhance the resilience of households to events and crises like COVID-19.

With more funding coming from the EU, cities have increased their efforts in the sector, incentivising and mandating higher energy and resource efficiency in buildings. Financial supporting mechanisms, such as grant and loan schemes, green mortgages, and on-bill financing are some of the policy frameworks aimed at driving the

Photo: Sarah Doffman – Unsplash

energy renovation. Whilst financing is a key bottleneck, it is also imperative to raise awareness and to support citizens in navigating the fragmented renovation market.

The social impact

Sustainable buildings have a direct social impact, particularly on the lowest income residents, who pay above-average on energy and electricity bills and, as a result, lack funds to cover other living costs.

According to the EU Energy Poverty Observatory, currently, 34 million households in Europe are experiencing energy poverty, which means they are unable to afford to keep decent standards of living and health, such as ensuring heating and cooling, lighting, and electricity to use basic equipment at home.

Energy renovations play a key role in lifting households out of fuel poverty. It is therefore important to increase the efforts on the supply of renewable energy sources and decrease the general consumption.

The UK Parliament estimates that around 10% of households in England are facing episodes of energy poverty. According to local governments, 330,000 houses in the West Midlands are experiencing energy-poverty, from which around 70,000 houses in Birmingham (2017). Considering the acquired socio demographic data, project 3D will address energy-poverty to ensure local actions are planned fairly.

According to a map published by Greater Manchester Poverty Action, there were 157,000 fuel poor households in Greater Manchester in 2018. Furthermore, they argue that 11.7% of households in Oldham live in energy poverty conditions. The Urban Energy Masterplans, which Carbon Co-op will undertake will explore models of energy ownership and decentralisation in order to make energy more affordable to all.


Photo: Jonathan Atkinson – Carbon Co-op


Photo: Jonathan Atkinson – Carbon Co-op

Photo: Jonathan Atkinson – Carbon Co-op

For more information, please visit action-fund.iclei-europe.org

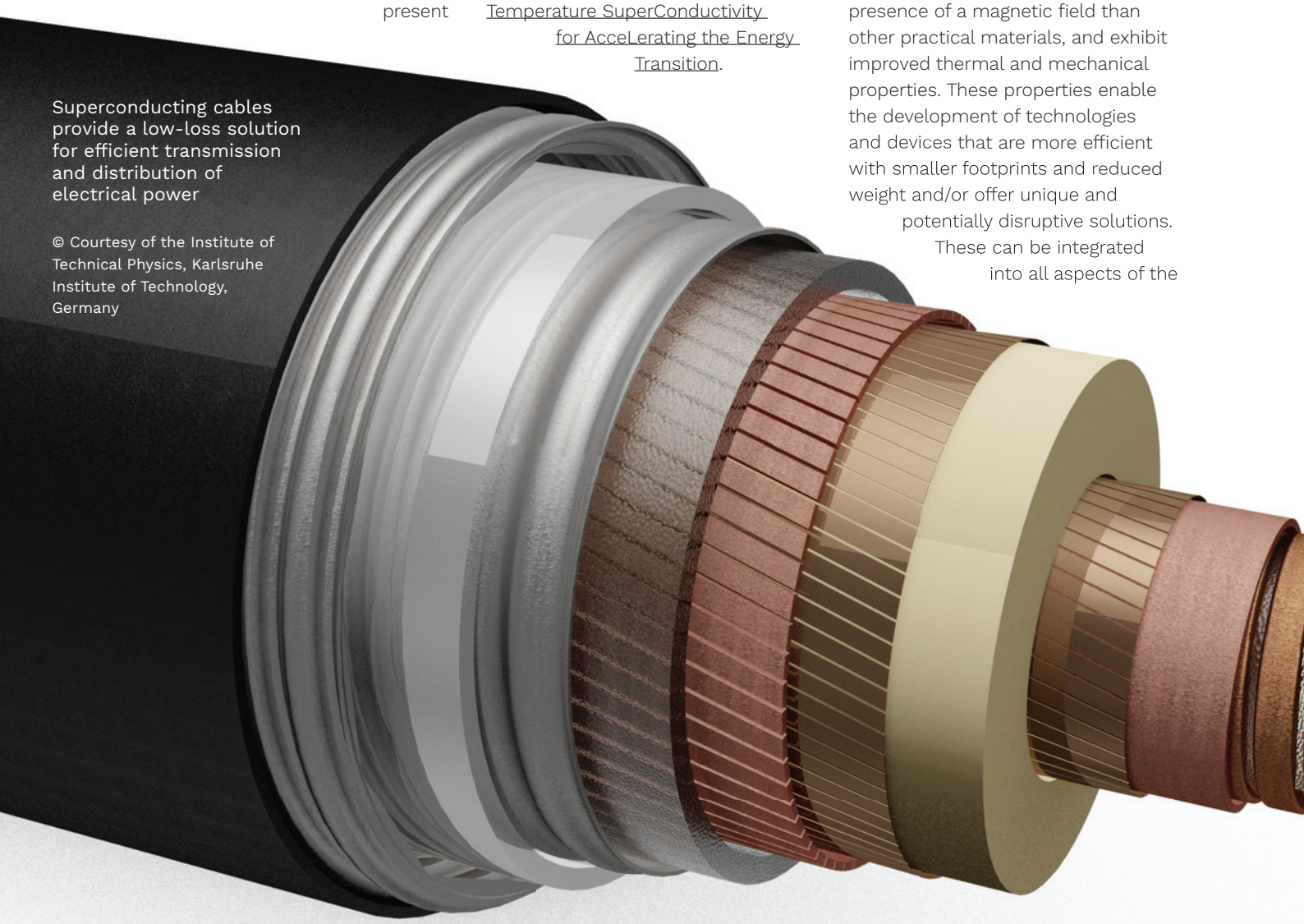
High-temperature superconductivity for accelerating the Energy Transitio

By Dr Mark Ainslie, EPSRC[1] Early Career Fellow, from Cambridge University, United Kingdom

Superconductivity is a fascinating state of matter characterised by the absence of electrical resistivity that particular materials exhibit when cooled below a certain critical, cryogenic temperature. Together with other unique properties, such as the ability to carry large currents and operate at extremely large magnetic fields, superconducting materials present innovative technological solutions towards accelerating the Energy Transition.

"The Energy Transition is an unavoidable global priority. We must decarbonise the economy by the second half of this century and tremendous challenges are ahead of us", says Professor João Murta Pina, from NOVA University of Lisbon, who chairs the COST Action High-Temperature SuperConductivity for AcceLerating the Energy Transition.

Since high-temperature superconducting (HTS) materials were discovered in the 1980s, there has been sustained interest in exploiting their superior properties in a range of practical, next-generation applications across the electric power sector. HTS materials are able to enter the superconducting state above the temperature of (cheap and abundant) liquid nitrogen, they can carry higher currents in the presence of a magnetic field than other practical materials, and exhibit improved thermal and mechanical properties. These properties enable the development of technologies and devices that are more efficient with smaller footprints and reduced weight and/or offer unique and potentially disruptive solutions. These can be integrated into all aspects of the



Superconducting cables provide a low-loss solution for efficient transmission and distribution of electrical power

"The Energy Transition is an unavoidable global priority. We must decarbonise the economy by the second half of this century and tremendous challenges are ahead of us."

electric power systems – from generation to transmission and distribution, energy storage and end-use – to improve their safety, security, reliability, and sustainability and to accelerate decarbonisation efforts.

Continual advances in manufacturing techniques have resulted in the commercial availability of long lengths (km+) of high-quality HTS wire from several manufacturers around the world and this has improved technological readiness levels and the commercial attractiveness of such devices.

"Increasing distributed renewable generation, changing transportation paradigms, and improving energy efficiency are some of the foundations for the Energy Transition. A multitude of challenges requires a variety of solutions. HTS-based technologies can address all these major challenges, and thus have a role in the solutions." – adds Prof. Pina.

However, despite all the potential benefits and successful demonstrators of numerous HTS technologies, they still lack mass penetration in the power system. Several reasons for this, as pointed out by industry, include concerns related to perceived high costs; uncertainty about the reliability of superconducting devices, including the cryogenic equipment that underpins such technology; and the perception that only highly skilled professionals would be able to operate such technology. Other concerns relate to a lack of systematic knowledge about the design of HTS systems for the power grid and how to simulate their performance using standard software packages.

To tackle all of the above challenges and to bring superconducting power applications closer to a commercial reality, a diverse network of experts in academia and industry – from over 20 countries across Europe and beyond – have been brought together through a four-year COST Action network called Hi-SCALE, which stands for High-Temperature SuperConductivity for AcceLerating the Energy Transition.

"We are excited and committed to train a new generation of experts – especially those from Inclusiveness Target Countries – who can evolve HTS technologies, bringing them to the real world to make an enormous contribution to future society" says Prof. Pina.

This COST Action aims at developing systematic approaches to create pathways between

materials research and real-world devices and foster improved modelling and advanced computation paradigms. Methodologies and demonstrators will be provided to address industrial challenges and applications, as well as tools for the economic and sustainability assessment of HTS technologies.

Through the generous funding of the COST Association, this Action will enable us to make great strides towards turning the potential of HTS materials into proven and breakthrough-capable technologies that will be key assets for a sustainable world.

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https://www.cost.eu/actions/CA19108/

1) Engineering and Physical Sciences Research Council (UK)

The future of biogas and biomethane in a decarbonized economy

By Angela Sainz Arnau, Communications Manager, European Biogas Association

Renewable gases are called to play an important role in de decarbonization of our economy. The EU has set a target to reach climate-neutrality by 2050. The measures and synergies that we put in place now will drive us towards that goal. Biogas and biomethane are renewable gases with huge potential to reduce emissions in multiple areas of our economy, including transport, industry, buildings and agriculture. At the end of 2019, our sector was producing 167 TWh or 15.8 bcm of biogas and 26 TWh or 2.43 bcm of biomethane with a total of 18,943 biogas plants and 725 biomethane plants across Europe[1].

Huge potential and strict sustainability criteria

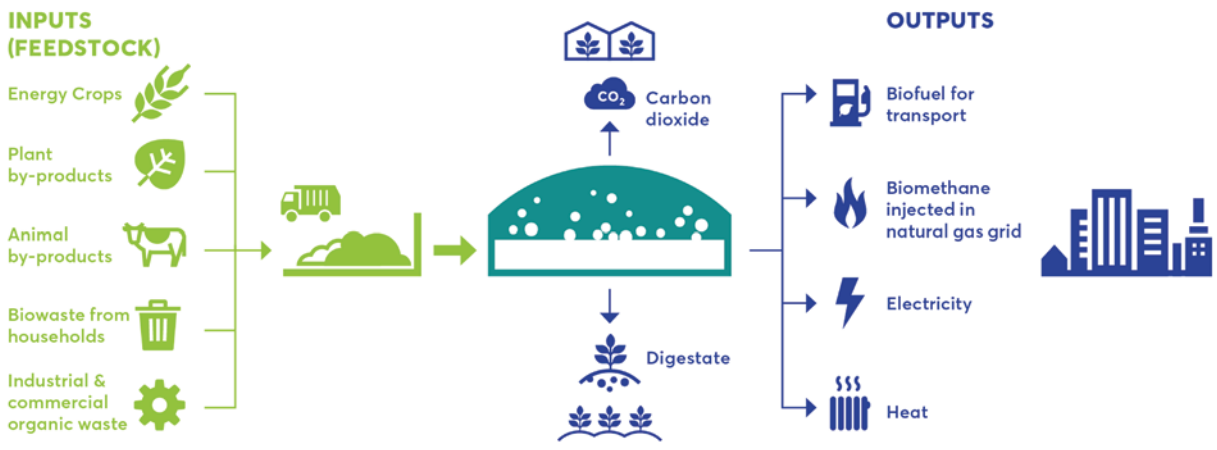
The biomethane market continues to grow significantly. Biomethane, produced from the purification of biogas, opens a wide range of opportunities for decarbonization because it can be directly injected into the gas grid and used as a substitute of natural gas. Biomethane production in 2019 rose by 15% relative to the previous year, the biggest increase in biomethane plants to date. Europe has also seen a rapid year on year growth in biomethane production capacity and so far this growth shows no sign of slowing down. A clear trend is also visible in feedstock usage for biomethane production: 2013 saw the beginning of a move away from energy crops, towards agricultural residues, bio- and municipal waste and sewage sludge. From 2017, almost no new plants were established to run on energy crops.

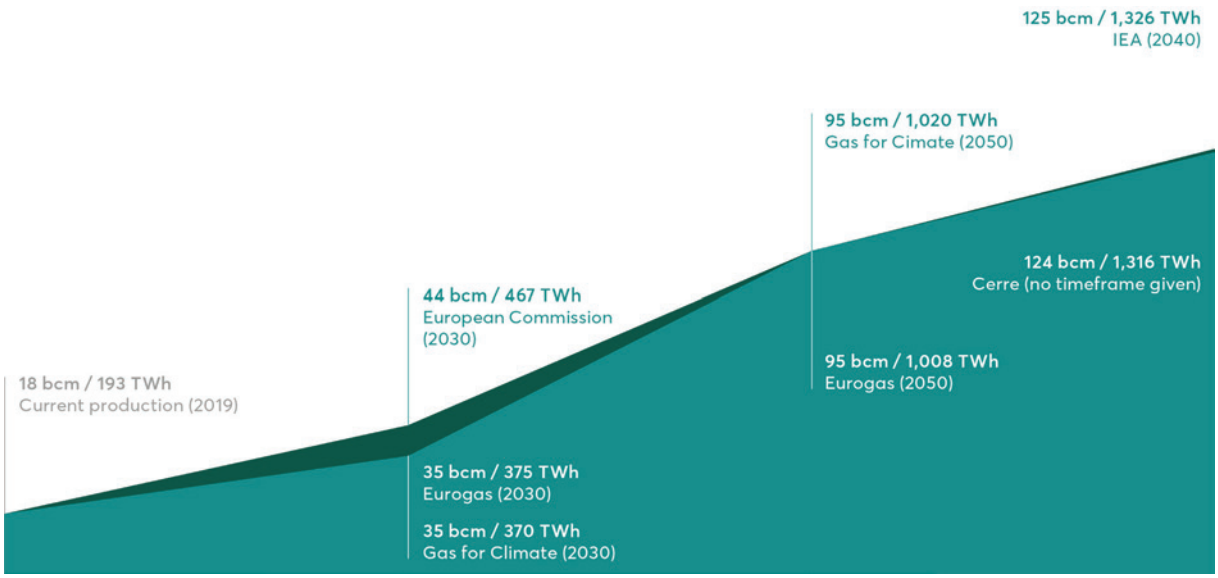
The scale-up of the sector is expected to grow in the coming years. When looking at different studies forecasting the future potential of biogas and biomethane, there is a strong consensus that by 2030, these sectors combined can almost double their production. The potential biogas and biomethane production calculated for 2030 could reach up to 44 bcm, equivalent to 467 TWh. By 2050, this production can more than quadruple.

Clean mobility with biomethane

One of the most promising areas of growth in the sector is the production of Bio-LNG and Bio-CNG, which can play a major role in the decarbonization of transport. Despite all current efforts from the EU, transport is the only sector which is not decarbonizing but shows even an increase in GHG emissions on a yearly basis since 2014[2]. There is an urgent need for further actions to reduce emissions in the transport sector. The development of green electric mobility is advancing but will not ensure alone the expected and much needed decarbonization in time and it will fall short to adequately cover all areas of transport. Other alternative green fuels can contribute, together with green electric mobility, to speed up transport decarbonization in the coming years and make sure its economic benefits remain in the EU.

Schematic overview of inputs and outputs of the biogas and biomethane production process





Europe's biogas and biomethane potential for 2030, 2040 and 2050, as calculated by the various studies, expressed in bcm and TWh

At the end of 2019, there were 107 active Bio-CNG plants and 1,160 Bio-CNG filling stations in Europe and this number is expected to rise significantly in the coming years. Bio-LNG production capacity is expected to reach 889 tpd by the end of 2022.

Besides the infrastructure, the technologies to enable the further deployment of biomethane in the transport sector are already available. Standard Internal gas Combustion Engines (ICE) are compatible with biomethane. The first studies on this show that ICE engines are not only performing better than the e-fueled engines in its CO_2 footprint at production level, but also at the end of life phase.

Heavy-duty (HD) transport is technically hard to electrify, as it requires highly rated power engines able to cover long distances while carrying a heavy payload. Yet, to operate a 40-tonne HD truck for over 1,000 km, an electric truck would require a 6.4 tonnes battery with today's best technology, while the same distance can be covered with some hundreds of liters of Bio-LNG.

If we look at maritime transport, this sector carries 80% of the world's goods. In the EU, maritime transport was responsible for over 138 million tonnes of CO_2 emissions in 2018 (3.7% of total EU emissions). With the shipping sector projected to grow further, the level of GHG emissions could even double by 2050[3]. With less than 1% of the world fleet runs on alternative fuels today[4], the decarbonisation of the shipping industry will require the use of zero or low carbon fuels, including Bio-LNG.

At the heart of an efficient circular economy

Apart from significantly reducing CO_2 emissions, these renewable gases are at the heart of a circular economy: they are the best way to recycle biowaste, used as biogas feedstock, and produce biofertilizers from digestate, a by-product of biogas production. This potential is pointed out in the Farm-to-Fork strategy of the European Commission that encourages farmers to invest "in anaerobic digesters for biogas production from agriculture waste and residues, such as manure.[5]"

The implementation of the EU Green Deal will be a determining factor in shaping the role of biogas and biomethane in future energy systems. A supportive and consistent legislative framework will accelerate our ongoing progress and encourage investment, helping the sector to reach a minimum of 380 TWh by 2030, with further growth in the years thereafter. This renewable energy is produced in Europe and has associated multiple socio-economic and environmental benefits that will directly benefit EU citizens.

1 When not otherwise indicated, all data used for the elaboration of this article are extracted from the EBA Statistical Report 2020: https://www.europeanbiogas.eu/eba-statistical-report-2020/
2 https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases/transport-emissions-of-greenhouse-gases-12
3 https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/642224/EPRS_BRI(2019)642224_EN.pdf
4 https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/659296/EPRS_BRI(2020)659296_EN.pdf
5 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381

iBRoad tools, methods and positive experience to catalyse stepwise deep renovation

By Alexander Deliyannis (pictured), Sympraxis Team, iBRoad project coordinator

We would never build a house without a plan, so why renovate it without one? The iBRoad project (2017-2020) developed and tested a set of tools and methods to guide and support building owners on their unique renovation paths towards energy efficient homes.

Renovating a building can be complex, expensive and time consuming. For building owners, the lack of knowledge about what to do, in which order to implement renovation measures, and how to finance them, are just some of the main obstacles to improving the energy performance and overall status of their building.

The iBRoad project (2017-2020) worked on lifting these barriers for building owners, increasing the rate and depth of renovation, and thus contributing to the Renovation Wave[1], by developing a Building Renovation Passport for single-family houses, testing it, and proposing measures to support its uptake by the European markets. This article briefly summarises iBRoad's results and experience.

iBRoad's Key Exploitable Results

A concept for the building renovation passport (individual building renovation roadmap plus logbook) based on existing initiatives. The iBRoad project developed – and tested in several countries– a concept for the building renovation passport as a modular framework comprising the renovation roadmap and logbook, both centred around an individual building: (a) A plan – the individual Building Renovation Roadmap – to gradually renovate a building over a long-term horizon (5-30 years). The plan is tailor-made for the building and its building owner. (b) A repository of information –the Building Logbook– able to include building photos and plans, energy consumption and production of the building, executed maintenance works, etc. The logbook includes the time dimension, so one is able to store successive 'snapshots' of the building state.

A flexible hybrid data structure for building information (common and country-specific). The iBRoad project recognised that building information includes parameters that are common across the EU, and others which are substantially differentiated between countries. To deal with this challenge, iBRoad developed a hybrid data structure – both at the conceptual and at the software tools level – covering both EU-shared and country-specific parameters. This allows the iBRoad approach to be adapted and implemented in all EU countries and possibly beyond.

An energy audit methodology and training, leading to the development of the roadmap. iBRoad's energy audit methodology is a step-by-step process to assess the state of a building, converse with the owner and comprehend their perspective, and develop a customised renovation roadmap.

Two functional software tools, iBRoad-Log and iBRoad-Plan. iBRoad-Log, the digital building logbook, and iBRoad-Plan, the programme used to generate the renovation roadmap, are powerful and flexible software tools that can be adapted and deployed by countries, regions, local administration, and other organisations to support implementation of their building policies.

Cost calculation methodology.

1. While iBRoad was conceived and largely implemented before the announcement of the Renovation Wave, it is fully fit for the latter's purpose.
2. Introducing Building Renovation Passports in Ireland: Feasibility Study https://www.igbc.ie/resources/introducing-building-renovation-passports-in-ireland-feasibility-study/
3. iBRoad final conference summary https://ibroad-project.eu/downloads/conference_summary
4. The iBRoad concept for Building Renovation Passports after COVID-19, European Energy Innovation, Summer 2020

Considering that cost concerns represent a critical factor that can determine the decision to renovate (or not), iBRoad developed a cost calculation methodology to help energy consultants in enabling building owners to base their decisions on reliable cost and return estimates.

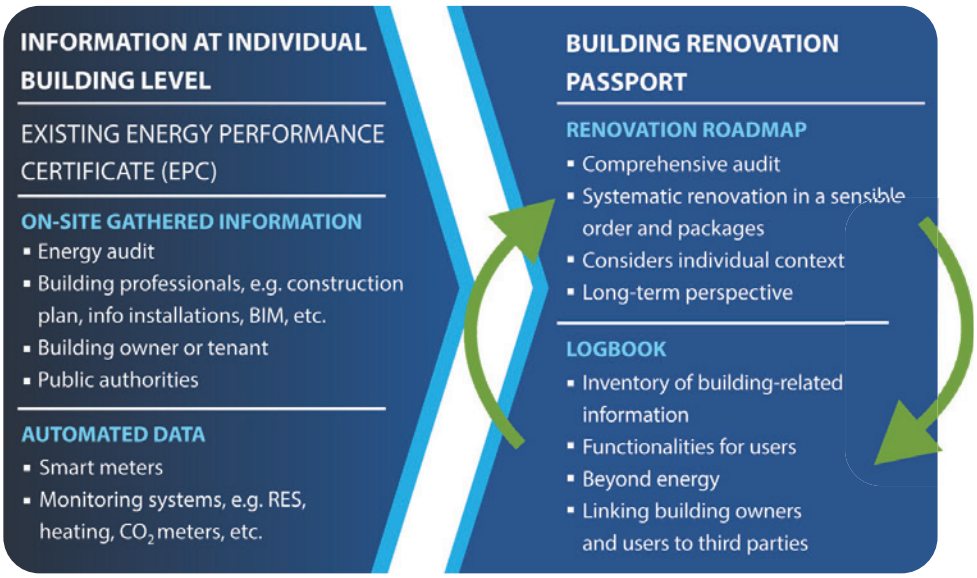
Public opinion and stakeholder analysis. The iBRoad project included extensive end-user research and stakeholder feedback on its background, concepts and tools. Such analysis helped in choosing paths and taking decisions during the development of the iBRoad tools and methods, and remains valuable for future undertakings.

Policy suggestions. The iBRoad concept unfolds its maximum impact when embedded into concomitant and supportive policies, ranging from informational and economic to regulatory; the project's outputs include such policy proposals for relevant topics.

All iBRoad tools and methods are characterised by modularity; an authority or other organisation can choose and adapt the ones most suitable for their specific situation without depending on the rest. For example, iBRoad tested both the roadmap and the logbook in Bulgaria, Poland, Portugal and Ireland, while only the logbook in Germany, a country that has already implemented building roadmaps known as iSFP (Individueller Sanierungsfahrplan für Wohngebäude) – the iSFP was in fact one of the frontrunner initiatives analysed when the iBRoad concept was under development. Similarly, an authority can choose to adopt the iBRoad audit methodology, while developing or adapting its own tools for collecting information and generating the renovation roadmaps.

Positive experience

As per feedback received through surveys and meetings with stakeholders, the results of iBRoad's pilot testing have been very positive –for both building professionals and owners– and supportive of larger-scale adaptation and deployment. Of particular interest is the case of Ireland which was not one of the iBRoad project's original pilot countries, and where iBRoad was tested thanks to collaboration with IGBC, the Irish Green Building Council; the relevant report[2] therefore represents an external view at iBRoad and its perspectives in the context of a specific country.



The future has a plan

iBRoad has contributed its share to the rising interest on Building Renovation Passports, logbooks and roadmaps, with its reports being downloaded more than 27,000 times from the project website alone.

At iBRoad's final conference, such tools have been called potential "game changers"[3] for the deep renovation of buildings in Europe. They already represent much more than proofs of concept or isolated initiatives. In the years since the iBRoad project's implementation began, a multitude of such efforts has sprung up around Europe. Equally importantly, such tools are being integrated in the greater policy context. In Germany, the new funding scheme BEG supporting building efficiency, now rewards building owners with an individual building roadmap (iSFP) by providing 5% more funding. And with Building Renovation Passports becoming increasingly relevant for national Long Term Renovation Strategies (LTRS), Portugal's recently unveiled LTRS includes direct reference to the paradigm developed by the iBRoad project.

While much of economic life has been slowed down due to COVID-19, even dealing with the effects of the pandemic can benefit from planning building renovations right[4]. The Renovation Wave should not wait.

The iBRoad project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 754045.

The future of bioenergy in Europe

By Martin Junginger (pictured right), Professor Biobased Economy, Copernicus Institute of Sustainable Development, Utrecht University

Forecasting the future is always a tricky thing. When I started my scientific career in 2001 as a PhD student, the future of bioenergy looked bright. Technical biomass potentials seemed vast, and concepts of GW-scale biomass gasifiers fueled by dedicated energy crops that would produce carbon-neutral, renewable electricity, heat and advanced biofuels certainly seemed possible by 2020. Looking back in early 2021, things have gone quite differently.

First of all, since the early days of modern bioenergy, the CO_2 emissions from bioenergy were considered climate-neutral and irrelevant by most scientists, knowing that while also biogenic short-cyclic CO_2 emissions do temporarily contribute to climate change (typically for a few years or decades) ultimately bioenergy contributes to long-term climate goals, as biomass substitutes fossil fuel use. But as of 2020, with the warming of the earth already rapidly heading towards 2°C (with irreversible impacts), some NGO's and scientists question just how many years (let alone decades) are acceptable before bioenergy performs better than the continued use of fossil fuels.

Second, with agricultural yield gaps stubbornly remaining within and outside the EU, dietary changes away from meat only occurring slowly, and fears of indirect land-use change impacts, the use of first generation crops has been capped and a substantial deployment of dedicated lignocellulosic energy crops has so far not been realized. Also, with fear of overexploitation of existing forests, NGO's and concerned scientists warn about misguided policies to further stimulate the use of woody biomass for energy, even if derived from sustainably managed forests with growing carbon stocks which primarily produce sawtimber and paper products. Whether these concerns are justified or not – it is clear that sustainable biomass is a scarce resource.

A third game-changer – outside the realm of bioenergy – is the massive cost reductions that solar PV, onshore and offshore wind have achieved (and will likely continue to achieve), pushing fuel-dependent power producers increasingly out of business. At the same time, the progress for most advanced

With global marine transport demand expected to more than double until 2050, marine biofuels are one of the options to decarbonize the sector. Courtesy of GoodFuels (https://www.offshore-energy.biz/eps-trials-biofuel-with-goodfuels/)

biomass conversion processes and associated cost reductions has been painstakingly slow, and full of set-backs.

Does this spell the end of bioenergy – or its role as a 'transitional fuel' at best? I don't think so. Bioenergy is the oldest form of energy known to mankind, and we should not write it off just yet. For sure, applications will (need to) change, and the relative importance of bioenergy compared to wind and solar energy will decline. "Simple" baseload electricity and low temperature heat production are not the optimal uses of scarce biomass – insulating buildings and using solar/wind powered heat pumps are ultimately smarter solutions to keep homes at 20°C for the largest part of the European built environment (but again, this will take decades to realize). But using biomass as a dispatchable source of both peak electricity and heat are interesting propositions next to other forms of storage. Also, for many high-temperature industrial heat applications that are hard to electrify, biomass is one of the few renewable alternatives available in

the next decades. Similarly, while the electrification of passenger road transport is progressing steadily, this transition is going to take 20-30 years. At the same time, the marine and aviation transport sectors are only at the very beginning of being decarbonized, hard to electrify, and thus will probably need a portfolio of solutions, biofuels being an important part of them.

But perhaps the biggest game-changer will be the paradigm shift of viewing biogenic CO_2 from being an irrelevant waste product to becoming a valuable source of renewable carbon for circular use and/or permanent storage. Many biomass conversion processes (e.g. anaerobic digestion or fermentation of sugars) but also gasification-based processes offer relatively cheap, concentrated and large-scale biogenic CO_2 point sources.

On the longer term, the advent of abundant renewable electricity will also allow for the production of low-cost green hydrogen. Combining both to produce synthetic fuels and materials to substitute the use of fossil oil would seem a cheaper and more effective approach than capturing CO_2 from thin air (the only other renewable carbon source, which however requires substantial additional amounts of renewable electricity).

Similarly, with the global carbon budget being depleted rapidly, the need for permanent CO_2 removal from the atmosphere is becoming increasingly urgent if we want to keep sight of the 1.5/2 degrees targets. While a large variety of both natural and technical solutions are being

developed, it seems obvious that none of them is the single silver bullet – again, a portfolio of options will be needed, and capturing and storing CO_2 from bioenergy is one option offering both limited costs as well as meaningful scale until 2050.

On the supply side, the increased use of (abandoned) agricultural land for energy crops in the EU could still be worthwhile exploring, but remains controversial and depends on (too?) many factors outside the direct control of the bioenergy sector. A less risky strategy would be to (gradually!) shift the use of biomass away from road transport and low-temperature heating to the other applications detailed above, and to incentive the increased use of agricultural and forestry biomass residues, as well as the use and restoration of marginal / degraded lands.

Obviously, also the latter sources also come with possible risks for biodiversity, soil, water etc. But under the current RED-II, there are already far-reaching environmental safeguards in place, and ultimately, implementing such requirements is just as much valid and relevant for the production of materials, feed and food as for bioenergy. The Dutch government recently subscribed to the development of a holistic sustainability framework for the use of biomass for energy and materials – prioritizing the use of materials; yet also providing a clear path for the use of biomass for biofuels in amongst others heavy duty transport as well. In my view, this is a much needed step also on EU level if we want to achieve a sustainable, circular biobased economy, in which bioenergy will have several roles to play.

Industry decarbonization can no longer be done à la carte

Up to now, each "course" for making industry climate-friendly has come piecemeal. It's time for a coherent three-course menu.

In December 2019, the European Commission's European Green Deal Communication talked tough on industry decarbonisation. It called for "a climate neutral and circular economy requir[ing] the full mobilisation of industry" and noted that "[t]o be ready in 2050, decisions and actions need to be taken in the next five years". This is absolutely true. But there's a problem: now that we see the legislative package emerging for the Green Deal, the action does not match the words.

Granted, the Commission's Work Programme for 2021 includes some elements to enable clean industrial investment. There is a very ambitious Hydrogen Strategy; the consultation on the EU ETS reform considers the option of Carbon Contracts for Difference to support the deployment of breakthrough technologies; and higher carbon prices, if coupled with strong anti-leakage measures, will also help.

Nevertheless, vital elements identified by the Green Deal Communication are not featured at all. For example, decarbonising industry will require massively expanding access to clean, affordable energy sources. Think: nearly ubiquitous direct electrification, biomass as a chemical feedstock, bioenergy coupled with carbon capture and storage for cement production, etc. However, such considerations have no clear place in the Commission's Work Programme, which only mentions hydrogen.

Similarly, the Green Deal Communication identifies the urgent need to create lead markets for low-carbon basic materials, such as cement, steel and bulk chemicals. However, the most obvious options for doing so do not appear to be part of the Sustainable Products Initiative (SPI):

- minimum environmental public procurement requirements,
- standardised CO_2 performance labels for basic materials,
- mandatory embedded CO_2 requirements for final products like buildings and vehicles, etc.

Under the current work program, the European legislator takes up industry elements piecemeal – not holistically – as supportive efforts in disparate policy initiatives that do not actually focus on industry decarbonisation. Parliament and the Council must instead identify the role each tool has in the toolbox of European industry decarbonizing. In short, a clear and coordinated vision of the "clean industrial policy package" is lacking.

A holistic approach would not just be better; it's also what the European Council implicitly tasked the Commission to do when adopting the 55% target: "propose measures that enable energy intensive industries to develop and deploy new climate neutral technologies while maintaining their industrial competitiveness".

According to the Commission's own Impact Assessment on the 2030 Climate Plan, about 142Mt (or 27%) of energy-intensive industry emissions in 2019 will need to be abated by 2030. Agora's analysis shows that this abatement can be achieved with a portfolio of relatively mature breakthrough technologies.

To kick-start these investments at scale, the EU must establish a coherent policy framework before 2030 if European industry is to stay ahead in international markets. For once, Industry groups, labour organisations, think tanks and NGOs tend to agree on what needs to happen: a comprehensive package of dedicated clean industry measures is urgently needed under 2030 climate legislation.

So how can this be fixed?

In March 2021, the EU's industrial strategy is to be updated in order to implement the European Council's mandate. Instead of cobbling together items à la carte, the Commission must use this overarching strategy document to put together a coherent three-course menu:

Firstly, it must provide a **compelling narrative** for how Europe's energy-intensive industry can become climate-neutral competitively. The narrative must address five issues:

- Expanded access to affordable clean energy and related infrastructure;
- Deployment of key low-carbon and circular materials technologies;
- Lead markets for low-carbon intermediate products;

- Circular, resource-efficient product design; and
- Governance and coordination of the clean industry transition.

Secondly**, it must set clear, ambitious milestones**. In particular, we would recommend the following milestones be set for 2030:

- In the steel sector, the EU should set a goal that at least 40 Mt of primary steel produced from "climate neutrality-compatible" technologies by 2030.
- In the cement sector, at least 16Mt of EU cement production should be linked to offshore carbon capture and storage.
- In the chemicals sector, the EU should see a portfolio of large-scale demonstrators for innovative biomass-to-chemicals technology developed.
- For the circular economy for basic materials, it is essential that innovative recycling technologies are established for chemicals and cement, which are critical for achieving the 2050 climate neutrality goal for industry.
- To electrify low-temperature industrial heat, the EU should aim for at least 50% industrial steam demand at up to 200°C supplied by power-to-heat technologies by 2030.

Thirdly, the new industrial strategy must **highlight specific legislative instruments** to develop a robust, ambitious EU framework for clean industry. In particular, key issues like clean energy, CCS infrastructure planning, and lead markets for low-carbon and circular products must find their place in the Commission's Work Programme.

Of course, recipes matter as well – and that's what Agora is working on. Further details on how this could be done are explained here.

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